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OF THE

LINNEAN SOCIETY OF LONDON.

On the Vegetation of Clarence Peak, Fernando Po; with Descriptions of the Plants collected by Mr. GUSTAV MANN on the higher parts of that Mountain. By J. D. HOOKER, Esq., M.D., F.R.S., F.L.S., &c.

[Read March 7th, 1861.]

A KNOWLEDGE of the temperate flora of any spot on the west coast of Tropical Africa has long been one of the greatest desiderata in botanical geography, not only on account of the intrinsic interest that must attach to the plants of the extremely few isolated points so elevated as to possess a temperate climate in that vast humid and torrid area, but also from the light such plants might be expected to throw on the floras of St. Helena, the Cape de Verd, and the Canaries; all of which (and especially the former) contain peculiar endemic genera, whose nearest allies might be expected to exist on the mountains of the neighbouring continent.

Within the last year the outlines of such a desiderated flora have been supplied by the energy and resolution of Mr. Gustav Mann, of the Royal Gardens, Kew, who was appointed by Lord John Russell (Foreign Minister) to succeed the late lamented Barter, as botanist to Dr. Baikie's Niger Expedition, but who, being unable to ascend the river and join that expedition, has devoted a year and a half to exploring the island of Fernando Po, and has twice reached its lofty summits, 10,700 feet above the sea; on both occasions collecting indefatigably and preserving his collections well.

Mr. Mann's account of the first of these ascents has already been read before the Society; he commenced the expedition on the 23rd March, 1860, and reached the summit on the 3rd April, where the temperature fell to 39° at night. The return was accomplished on the 13th of the same month. A second ascent was attempted on the 7th of November, and after eighteen days he had nearly reached the top, when his men rebelled, and he was obliged to return to Clarence. He started a third time, and reached the summit in December, but the dates and detailed narrative of this ascent have not yet arrived.

The following notes chiefly refer to the temperate plants, all but one of which (*Sanicula Europæa*) were collected at or above 5000 feet elevation. They amount to 76 species (in 66 genera), a singularly small number for 5700 feet of vertical height almost under the equator. Of these fully 20 are tropical types that ascend a little above 5000 feet, and must be excluded from the temperate flora. The remaining 56 belong to no fewer than 45 genera; proving the flora to be an extremely fragmentary one.

Of the total 76, 37 are Abyssinian species, and 16 others closely allied to such; and of the 56 temperate, 32 are also natives of the mountains of Abyssinia, most of them being absolutely specifically identical, and others but slightly differing; such differences being in some cases doubtless apparent rather than real, and owing to the want of a larger suite of specimens; 13 others also are very closely allied to Abyssinian species.

Again, of the Abyssinian mountain plants common to Clarence Peak, no fewer than 17 are absolutely peculiar to these two localities as far as is at present known, including some very remarkable plants; as

Clematis Simensis
Thalictrum rhynchocarpum
Sagina Abyssinica
Trifolium subrotundum
—— Simense
Helichrysum chrysocoma
—— Hochstetteri
—— globosum
Blæria spicata
Stachys aculeolata, n. sp.
Pycnostachys Abyssinica
Calamintha Simensis
Cyanotis Abyssinica ?
Kyllingia macrocephala
Trisetum lachnanthum
Festuca Schimperiana
Gymnandropogon, sp.

Besides these are the following, which are not found south of Abyssinia in Africa:—

Galium rotundifolium
Parietaria Mauritanica
Deschampsia cæspitosa
Brachypodium sylvaticum.

Others are common to Abyssinia, the Mauritius, Madagascar, &c.: as

Viola Abyssinica
Hypericum angustifolium
Geranium Simense
Rubus apetalus
Carex Boryana.

There are, again, other species whose only near affinities are with Abyssinian: as species of

Agrocharis
Gymnosciadium?
Dichrocephala
Swertia
Plectranthus
Veronica
Euphorbia
Habenaria.

Extending the comparison to genera, I find that of the 66 Clarence Peak genera only 7 are not Abyssinian, and of the 45 temperate genera 41 are temperate Abyssinian. Of the 3 remaining, *Luzula* and *Schœnus* may yet be found in Abyssinia, and *Leucothoe* is a Mauritius plant.

The next affinity is with Mauritius, Bourbon, and Madagascar: of the whole 76 species, 16 inhabit these places, and 8 more are closely allied to plants from there. Three temperate species are peculiar to Clarence Peak and the East African Islands, including *Leucothoe angustifolia*, *Sebæa brachyphylla*, and *Carex Wahlenbergiæ*. *Ericinella* and *Leucothoe* are the only genera not Abyssinian, which are common to these islands and to Fernando Po.

Lastly, if compared with the Cape, the contrast is very striking: not only is there a total want of any true Cape types, except such few as are common to Abyssinia or the Eastern African Islands (5 species), but only 12 of the 76 Fernando Po species are known to be South African; and of these all but *Luzula* have been also found in Abyssinia. Only 12 others are nearly related to South African forms. Turning to the genera, *Peddiea* is the only peculiarly South African one; and this is not temperate at Fernando Po, and is subtropical in South Africa.

Hence the result of comparing the Clarence Peak flora with that of the African continent is—1. The intimate relationship with Abyssinia, of whose flora it is a member, and from which it is separated by 1800 miles of absolutely unexplored country*; 2. the curious relationship with the East African Islands, which are still further off; 3. the almost total dissimilarity from the Cape flora.

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* This result is strongly in favour of the existence of a chain of mountains crossing Central Africa, from Abyssinia to the Cameroons Mountains, of whose probable existence M. du Chaillu has recently procured evidence.

With the West African Islands again, contrary to my expectations, there is no marked relationship whatever, except obscurely with St. Helena through *Wahlenbergia arguta*: the arborescent *Compositæ* and *Lobeliaceæ*, *Phylicæ*, *Melhaniæ*, *Frankenia*, *Acalypha*, and frutescent *Heydotis* of St. Helena, being wholly unrepresented in Fernando Po.

Taking a still wider range, the temperate flora of Fernando Po belongs to the northern hemisphere. Of the 48 temperate genera, 12 only are not European; whilst the following species are European, and most of them British:—

Oxalis corniculata
Sanicula Europæa
Galium Aparine
—— rotundifolium
Limosella aquatica
Parietaria Mauritanica
Luzula campestris
Deschampsia cæspitosa
Brachypodium sylvaticum.

The two following are also probably states of European plants:—*Ranunculus pinnatus*, very near *R. philonotis*; *Calamintha Simensis*, near *vulgaris*.

RANUNCULACEÆ,

Of this Order, which is very far from well-represented, even in the temperate and alpine regions of Tropical and Southern Africa, three genera, each containing a single species, were collected by Mr. Mann on Clarence Peak. All are Abyssinian; one only, and that a plant of very wide distribution, is South African also.

1. Clematis Simensis, *Fresen*; *Rich. Fl. Abyss.* i. 3.

Hab. In Clarence Peak, alt. 4–8000 ped. (fl. Nov.)—Alte scandens, 120-pedalis! Flores albi.

The flowers are a little smaller than the Abyssinian specimens. A. Richard describes this species as glaucous in all its parts, but such is not the case in all our authentically named specimens, nor in these from Fernando Po, which have also more membranous foliage; such differences are what the more humid climate of West Tropical Africa would lead us to expect. The lower parts of the filaments are also rather more silky in Mann's specimens, but this is a variable character. I have no fruiting individuals. This species is found throughout Abyssinia at 8000 feet elevation.

2. Thalictrum rhynchocarpum, *Quart. Dill. & Rich.*; *Rich. Fl. Abyss.* i. 3.

Hab. In Clarence Peak, alt. 10,000 ped.

Herba 12-pedalis. Fl. virides. Stamina numero varia, interdum plurima.

A most remarkable species, and quite unlike any other hitherto described. A. Richard rightly characterizes it as one of the best-marked species of the genus. Mann's specimens are in flower only, and have the pinnules sometimes a little more divided than in Abyssinian ones; it is not uncommon in mountain woods of Abyssinia.

3. Ranunculus pinnatus, *Poir.*, var. *extensa* carpellis lævibus.

Hab. In Clarence Peak, alt. 8500 ped. (fl. Dec.)

Caules graciles, elongati, flexuosi, interdum ad nodos radicantes. *Folia* longe et gracile petiolata, pinnata v. biternata, foliolis longe petiolulatis.

This in every respect agrees with *R. pinnatus*, Poir, of Southern Africa, except in its more drawn-out habit (a feature doubtless attributable to the climate of Fernando Po), and the total absence of any tubercles on the carpels. This last, however, is a variable character, and often wanting in the very closely allied *R. philonotis*, Retz., of Europe, which, with the present and some other plants of India and America, will, I suspect, ultimately prove to belong to one collective, widely diffused species.

MENISPERMEÆ.

1. Stephania hernandifolia, *Wall.*; *H. f. & T. Flor. Ind.* i. 196. cum Syn.

Hab. In Clarence Peak, alt. 3–5000 ped. (fl. Dec.)

Identical with the Indian plant, which is also a native of various parts of Tropical and Southern Africa, Java, and Australia.

VIOLARIEÆ.

1. Viola Abyssinica, *Steud.*, var. *impunctata*.

Hab. In Clarence Peak, alt. 10,000 ped. (fl. April.)

Caules repentes, elongati, hic illic radicantes. *Folia* impunctata. *Flores* pallide purpurei.

Except in wanting the oblong brown maculæ on the foliage, I can find no distinction whatever between this and the plant of Abyssinia, where as at Fernando Po, it grows in the region of heaths. It is also found in Madagascar with unspotted foliage.

PITTOSPOREÆ.

1. PITTOSPORUM MANNII, *H. f.* Foliis elliptico-lanceolatis utrinque attenuato-acuminatis margine undulatis, paniculis ramosis multifloris puberulis, floribus parvis, capsula parva latissime obovoidea.

Hab. In Clarence Peak, alt. 8500 ped. (fl. Dec.)

Frutex 20-pedalis. *Folia* petiolata, glaberrima, $2\frac{1}{2}''$–$3\frac{1}{2}''$ long., utrinque viridia, glaberrima. *Panicula* subpyramidalis, $1\frac{1}{2}''$ long., erecta, ramis erecto-patentibus. *Flores* $\frac{1}{5}''$ long., flavi; sepalis basi connatis, acutis, glabriusculis petalis obtusis dimid. brevioribus; ovario staminibusque glaberrimis. *Capsula* (unica tantum visa) $\frac{1}{4}''$ long., $\frac{1}{3}''$ lata, basi abrupte angustata, apice retusa.

Allied to *P. Abyssinicum*, Hochst., which has generally obtuse leaves; and more closely still to the Mauritius *P. Senacia*, Putt., but differing from both in the erect paniculate inflorescence, smaller flowers and very different capsule.

CARYOPHYLLEÆ.

1. Sagina Abyssinica, *Hochst.*; *Rich. Fl. Abyss.* i. 47.

Hab. In Clarence Peak, alt.? (fl. Dec.)

This is absolutely identical with the Abyssinian plant, and is a very distinct species from any other. The flowers are often tetramerous. The only other Fernando Po plant of this order is *Drymaria cordata*, W., which grows at low levels.

HYPERICINEÆ.

1. Hypericum angustifolium, *Lamk.*; *DC. Prodr.* i. 545.

H. leucoptychodes, *Steud.*; *Rich. Fl. Abyss.* i. 96.

Hab. In Clarence Peak, 7–10,000 ped. copiosissime. (fl. Dec.)

Arbuscula 30-pedalis. *Folia* interdum et sepala secus marginem punctata, sæpius omnia impunctata.

The Bourbon specimens of this noble plant have the leaves rather narrower than the Abyssinian, and wholly impunctate. In both the Fernando Po and Abyssinian specimens, the calyx and leaves have sometimes the margins punctate. The leaves of the Fernando plant are in some specimens like the Abyssinian, in others like the Bourbon. It is a very common tree in the mountains of Abyssinia.

GERANIACEÆ.

1. Geranium Simense, *Hochst.*; *Rich. Fl. Abyss.* i. 116.

G. Emirnense, *Hils. & Bojer*, MSS. in *Hb. Hook.*

Hab. In Clarence Peak, alt. 8500 ped. (fl. Ap.–Dec.)

Mr. Mann's specimens are identical with Bojer's Madagascar *G. Emirnense*, and with some of Schimper's Abyssinian *G. Simense*, which A. Richard describes as a very variable plant, and common in the cold regions of Abyssinia.

BALSAMINEÆ.

This order is probably common in the hilly regions of Tropical Africa, whence I have seen about a dozen species. Only one, however, is described as Abyssinian, and one South African. I shall here describe four Fernando Po species, of which only one ascends to 5000 feet, and none have been found above that elevation. I have referred these to the sections adopted in the monograph of the East Indian species, published in the fourth volume of this Journal. They are as follows:—

1. UMBELLATÆ. Folia alterna. Flores ad apicem pedunculi elongati congesti v. dense racemosi.
2. UNIFLORÆ. Folia alterna. Pedicelli in axillis foliorum solitarii v. fasciculati, uniflori.
3. LATERIFLORÆ. Folia alterna. Flores racemosi, racemi foliis breviores v. axillis foliorum inferiorum dispositi.

1. IMPATIENS (UMBELLATÆ) FILICORNU, *H.f.* Foliis longe petiolatis,

late ovatis acutis setoso-crenatis, pedunculis elongatis gracillimis, apice floriferis, bracteis imbricatis cymbiformibus caducis, sepalis lateralibus obtusis, vexillo erecto late oblongo, labello planiusculo, calcare strictiusculo gracillimo alis æquilongo instructo.

Hab. In Clarence Peak, alt. 5000 ped. (fl. Dec.)

Herba tota glaberrima, pedalis; caule gracili simplici. *Folia* alterna, sub 2″ long., petiolis æquilonga, membranacea. *Pedunculi* laterales folia superantes, gracillimi, apices tantum floriferi, et ibi bracteis delapsis cicatricati. *Bracteæ*, $\frac{1}{3}$″ long., obtusæ. *Pedicelli* gracillimi, $\frac{3}{4}$″ long., erecti. *Flos* pallide purpureus, 1″ diamet. planus. *Alæ* bilobæ, lobo laterali brevi obtuso, terminali oblongo obtuso.

This has very much the habit of the Ceylon *I. subcordata*, Arn.

2. Impatiens (Unifloræ) Mannii, *H. f.* Caule gracili basi repente, foliis subdistantibus gracile petiolatis, petiolo glanduloso, ovatis acuminatis basi attenuatis setuloso-crenatis, pedicellis 1–2-axillaribus gracilibus ebracteolatis 1-floris, sepalis lateralibus parvis, vexillo mediocri, labello late conico calcare gracili curvo, alis longe gracile petiolulatis, lobo laterali unciformi parvo, terminali lato.

Hab. In Fernando Po, alt. 4000 ped. (fl. Dec.)

Herba 2–3′-pedalis, glaberrima, gracilis. *Folia* 2–3″, petiolo, $\frac{1}{2}$″–1″, glandulis gracilibus ornato. *Pedicelli* graciles, petiolis breviores, fructiferi deflexi. *Flores* pulcherrimi, "rubidi" (*Mann*), sicco violacei, labello transverse fasciato. *Alæ* cum ungue gracili fere 1″ longæ.

3. Impatiens (Unifloræ) bicolor, *H. f.* Suffruticosa, foliis confertis petiolatis elliptico-lanceolatis obtusis v. acuminatis basi attenuatis grosse setuloso-crenatis, pedicellis unifloris in axillis foliorum solitariis v. confertis ebracteolatis, vexillo parvo erecto, labello amplo late saccato basi in cornu valido ascendente incurvato contracto, alis parvis late oblongis obtusis.

Hab. In Fernando Po, alt. 4000 ped. (fl. Dec.)

Herba 2–3-pedalis, caule basi lignoso robusto, nodoso, superne cicatricato. *Folia* versus apices caulis conferta, patentia, 4–6″ long. in petiolum 1″ long. angustata, subcarnosula. *Flores* conferti, perplurimi (v. rarius pauci), bicolores, pedicellis 1″ long., sæpissime liberis, interdum in pedicellum brevem fasciculatis. *Sepala lateralia* parva, viridia. *Vexillum* flavo-virens $\frac{1}{3}$″ long., erectum. *Labellum* purpureum. *Alæ* longitudine oris labelli, flavæ purpureo lineatæ.

4. Impatiens (Laterifloræ) hians, *H. f.* Foliis alternis longe petiolatis ovatis acuminatis basi rotundatis longe setosis setuloso-crenatis, racemis ex axillis inferioribus ortis, bracteis ovato-lanceolatis persistentibus, floribus magnis hiantibus, vexillo amplo erecto orbiculato dorso alato, labello demisso longe crasse conico stricto ore valde obliquo, alis linearibus.

Hab. In Fernando Po, alt. 2000 ped. (fl. Dec.)

Herba gracilis, erecta, glabra, 2$\frac{1}{2}$-pedalis, caule simplici basi radicante.

Folia membranacea, glaberrima v. superne sparse pilosa, $2\frac{1}{2}''$–4″ long., basin versus utrinque setis $\frac{1}{2}''$–$\frac{1}{4}''$ longis filiformibus 1–2 ornata; petiolo 1″ long. *Pedunculi* foliis breviores, patentes, 2–6-flori. *Flores* gracile pedicellati, rubri, bilabiati. *Sepala lateralia* viridia, $\frac{1}{4}''$ long. *Vexillum* $\frac{3}{4}''$ lat., dorso late alatum. *Labellum* $1\frac{1}{2}''$ long. *Alæ* ore labelli subæquantes, v. paulo superantes. *Capsula* linearis.

There is another species of *Impatiens* in the Herbarium, but in too imperfect a state for description.

Nat. Ord. OXALIDEÆ.

1. Oxalis corniculata, *L.*

Hab. In Clarence Peak, alt. 8500 ped.

Nat. Ord. OCHNACEÆ.

1. GOMPHIA MICRANTHA, *H. f.* Glaberrima, foliis lanceolatis acuminatis serrulatis utrinque nitidis venis remotis arcuatis, racemis terminalibus elongatis paucifloris vix ramosis folio brevioribus, floribus minutis remote fasciculatis glaberrimis.

Hab. In Clarence Peak, alt. 5000 ped. (fl. Nov.)

Frutex 15-pedalis. *Rami* graciles, virgati, teretiusculi. *Folia* breve petiolata, 4–6″ long., membranacea, utrinque concolora. *Racemi* gracillimi, pauciflori. *Flores* breviter pedicellati, 1‴ longi. *Calyx* brunneus, foliolis oblongis. *Petala* rufa.

LEGUMINOSÆ.

The three plants of this family which have been found above 5000 feet, are all essentially temperate forms—one *Cytisus*, typical of the Mediterranean region and Canary Islands, but hitherto unknown in Tropical Africa, and known by one species only in Abyssinia: the others belong to *Trifolium*, also a Mediterranean genus, but several species of which are Abyssinian, including both the Fernando Po ones.

1. CYTISUS MANNII, *H. f.* Sericeo-pilosa, ramulis divaricatis villosis, foliis parvis brevissime petiolatis stipulis subulatis, foliolis elliptico-lanceolatis involutis, floribus ad apices ramulorum confertis sessilibus, calycis labio superiore late bifido.

Hab. In Clarence Peak, alt. 9000 ped. (fl. Dec.)

Frutex 5–6-pedalis, ramis lignosis, ramulisque divaricatis teretiusculis. *Folia* solitaria et fasciculata, $\frac{1}{4}''$ long., stipulis subulato-lanceolatis petiolo adnatis, foliolis acutis $1\frac{1}{2}'''$ long. *Flores* flavi, $\frac{1}{3}''$ expans. *Calyx* bilabiatus, sericeus, labio superiore late bifido lobis acuminatis, inferiore apice trifido, lobis subulatis. *Vexillum* orbiculatum dorso sericeum. *Alæ* carinam obtusam genitalia includentem æquantes. *Staminum* tubus integer. *Ovarium* hirsutulum; stylo gracili mediocri; stigmate fere terminali; ovulis paucis.

2. Trifolium subrotundum, *Steud. & Hochst.*; *A. Rich. Flor. Abyss.* i. 172. *Var.* stipulis majoribus.

Hab. In Clarence Peak, alt. 9000 ped. (fl. Dec.)

Herba diffusa, 1–2-pedalis, corolla rubra.

A common Abyssinian plant, cultivated as horse-forage according to Dr. Roth (Herb. Hook.). The Fernando Po specimens differ in having larger stipules ($\frac{3}{4}''$ long.) than the Abyssinian, in which, however, they are very large for the genus (nearly $\frac{1}{2}''$): in habit, foliage, inflorescence and flowers they are identical.

3. Trifolium Simense, *Fresen*; *A. Rich.*, l. c. 171.

Hab. In Clarence Peak, alt. 8500 ped. (fl. Dec.)

Herba $1\frac{1}{2}'$ alt., corolla violacea.

Very similar, as A. Richard indicates, to *T. subrotundum*, but well distinguished by the calyx, very narrow leaflets, and short petioles. The stipules terminate in a long filiform appendage, both in the Fernando Po and Abyssinian specimens.

ROSACEÆ.

1. Rubus apetalus, *Poir.* *Var.* glabrior petalis parvis instructa.

Hab. In Clarence Peak, alt. 7000 ped. (fl. Nov.)

Scandens 12–15-pedalis. *Petala* alba, valde caduca.

This is clearly a form of *R. apetalus* of Bourbon, of which I have examined a Bourbon specimen gathered by Carmichael. Another form of it, sometimes bearing petals, and otherwise differing in having glabrous carpels, is found in Madagascar. A third, always petaliferous, is the *R. exsuccus*, Steud., of Abyssinia, which is described by A. Richard (Fl. Abyss. i. 256) as having the fruit entirely dry, but of which Dr. Roth remarks, "Berries eatable" (MS. in Hb. Hook.). Dr. Kirke, who has gathered the latter species in the Shirà Mountains (Livingstone's Exped., 1860), says, "Fruit good, exactly like the bramble, but small." The Fernando Po specimens are are not in fruit. This species has not been found in South Africa.

UMBELLIFERÆ.

1. Sanicula Europæa, *L.*

Hab. In Fernando Po, alt. 4000 ped. (fl. Nov.)

I should suspect some error in the low elevation assigned by Mr. Mann to this plant, were his specimens not so carefully ticketed in other cases that I have every reason to put confidence in this. A. Richard gives *S. Europæa*, var. *Capensis*, as a native of Abyssinia; he does not, however, say what the characters of that variety are, and adds that his specimens are identical with Parisian. This plant has a very wide range in the mountainous regions of both Americas and Asia, and is also found in South Africa.

2. AGROCHARIS GRACILIS, *H. f.* Caule elongato ramoso foliisque hispidulo-pilosis, foliis gracile petiolatis bipinnatisectis segmentis lanceolatis acutis incisis, pedunculis elongatis sub apices patentim hispidis pilis flexuosis, floribus dense congestis.

Hab. In Clarence Peak, alt. 7000 ped. (fl. Dec.)

Herba gracilis, 4-pedalis, *A. melananthæ* (Abyssiniæ) quam maxime affinis, differt caule gracili elongato ramoso, foliis magis pilosis, capi-

tulis minoribus densius congestis, pedunculisque apices versus patentius pilosis pilis laxioribus flexuosis.

It is with some hesitation that I venture to describe this plant as different from the Abyssinian, fearing the characters depend wholly on locality. This curious genus is allied to *Daucus,* and the Abyssinian is the only previously described species.

3. Gymnosciadium ? ?

Hab. In cacumine Clarence Peak, alt. 10,000 ped.

Herba pilosa, radice valida insapida, caulibus 4–6 ″ longis ; foliis pinnatis, pinnis paucijugis crenatis rhombeo-rotundatis reniformi-rotundatisve terminali cordato. *Umbellæ* compositæ. *Involucrum* generale nullum, partiale foliolis paucis. *Calycis* margo integer. *Petala* inflexa. *Styli* breviusculi.

This may belong to the Abyssinian genus to which I have doubtfully referred it; but not being in fruit, nothing can be made of it.

4. Genus ?

Hab. In Clarence Peak, alt. 9500 ped. (fl. Dec.)

Herba glabra, elata, 2–3-pedalis ; radice insapida ; caule tereti striato ; foliis radicalibus tripinnatis, foliolis ovato-lanceolatis, lobatis, pinnatifidisve, segmentis acutis. *Umbella* composita. *Involucrum* universale et partiale foliolis paucis linearibus. *Calycis* limbus 5-lobus, lobis acutis. *Petala* inflexa. *Styli* mediocres recurvi. *Mericarpia* immatura anguste oblonga, late alata, dorso 5-juga.

This is a very ordinary form of *Umbellifera,* presenting no striking character.

ARALIACEÆ.

PARATROPIA MANNII, *H. f.* Glaberrima, foliis 4–9 foliolatis, petiolis petiolulisque gracilibus, foliolis ovato- v. oblongo-lanceolatis longe acuminatis integerrimis superne lucidis venis inconspicuis, marginibus subundulatis, floribus in capitulos arcte connatis, capitulis secus ramos simplices elongatos racemosis longe pedunculatis.

Hab. In Ins. Fernando Po, alt. 5000 ped, (fl. Dec.)

Arbor 40-pedalis, caule crasso. *Folia* stipulata, stipulis 1″ dorso supra medium petiolo adnatis ovato-lanceolatis subspathaceis ; petiolo 6–8″, tereti ; petiolulis 1½″ apice subarticulatis ; foliolis 4–7″ coriaceis, inferne opacis. *Inflorescentia* ut videtur terminalis, ramis floriferis in ramulo apice crasso confertis, 1′ et ultra, strictis, erectis, v. erecto-patentibus, basi bracteatis ; bracteis stipulis similibus. *Capitula* diam. pisi, globosi, sub-20-flori, secus pedunculos floriferos racemosi, pedunculis crassis 1″ long. post anthesim sæpe decurvis. *Flores* sub $\frac{1}{6}$″ expans., flavi, hermaphroditi ? bracteolis late ovatis pubescentibus ovario brevioribus suffulti. *Ovarium* late obconicum, 5-loculare, obscure angulatum. *Calycis* limbus truncatus, integer, brevis, liber. *Petala* ovata apice inflexa. *Filamenta* subulata petala æquantia ; antheris breviter oblongis flavis. *Stigmata* punctiformia, disco late conico vix elevato.

A very handsome plant, of which Mr. Mann has collected excellent specimens.

RUBIACEÆ.

1. Galium Aparine, *L.* *Var.* hamatum.

G. hamatum, *Hochst.*; *A. Rich. Flor. Abyss.* i. 345.

Hab. In Clarence Peak, alt. 6–8000 ped. (fl. Dec.) Flores flavi.

I find it impossible to distinguish this from G. *Aparine*, L. A. Richard remarks of the Abyssinian specimens of *hamatum*, that the hooks of the leaves are stronger and more marked than in any other of the genus; but I do not find them to be so in his or this plant, though more strong than in many European specimens of G. *Aparine*. Mr. Mann describes the flowers as yellow, A. Richard as *apparently* purple. It is also a native of South Africa and many other parts of the world.

2. Galium rotundifolium, *L.* *Var.* foliis acutioribus.

Hab. In cacumine Clarence Peak, alt. 10,000 ped. (fl. Dec.)

All the leaves of the Fernando Po specimens are acute, or rather mucronate; some of those of the Abyssinian specimens are so too, whereas in the European and Indian forms they are more or less obtuse: still all the other characters appearing identical with those of the European, I cannot separate this on the grounds of one which is variable. Mann describes the flowers as yellow; in the dried specimens they appear white.

3. ANTHOSPERMUM ASPERULOIDES, *H.f.* Parvulum, caule flexuoso teretiusculo hirtello, foliis parvis fasciculatis lanceolatis subsessilibus, stipulis utrinque rigide subulatis marginibus recurvis parce hispidulis, floribus parvis tetrameris, coccis oblongis lævibus glaberrimis.

Hab. In cacumine Clarence Peak, alt. 10,000 ped. (fl. Dec.)

Herba parvula, 8″ alt., parce ramosa, foliosa. *Caules* teretiusculi. *Folia* densa, patula, $\frac{1}{4}''$ long.

Allied both to Cape and Abyssinian species, but distinct from any known to me by the small size, flexuose habit, and erect subulate limb to the sheathing stipules.

COMPOSITÆ.

1. VERNONIA CLARENCEANA, *H.f.* Erecta, herbacea, gracilis, subhispido-pilosa; caule parce diviso subflexuoso, foliis linearibus lineari-lanceolatisve sessilibus semi-amplexicaulibus remote serrato-dentatis acuminatis, capitulis multifloris ad apicem caulis congestis breve pedunculatis, pedunculis tomentosis, involucri late campanulati squamis rigidiusculis lineari-lanceolatis acuminatis purpureis, dorso pilosis subherbaceis.

Hab. In Clarence Peak, alt. 8500 ped. (fl. Dec.)

Herba rigidiuscula, 1–2-pedalis. *Caulis* purpureus, laxe foliatus, superne subvillosus. *Folia* 2–3″ long., suberecta, paulo recurva, $\frac{1}{3}''$–$\frac{3}{4}''$ lat., inferiora in petiolum subangustata, superiora basi latiora, rigide membranacea, utrinque subhispido-pilosula, nervis paucis prominulis. *Capitula* 10–15 ad apices ramulorum, $\frac{1}{3}''$ long. et lat. non bracteata.

Involucri squamæ sub 2-seriales, enerves, margine scariosæ. *Receptaculum* planum, foveolatum, nudum. *Flores* numerosissimi, perplurimi fœminei; tubus corollæ gracilis, pappo et stylo gracili dimidio brevior. *Pappus* albus, nitidus, 1-serialis, pilis filiformibus flexuosis scaberulis. *Achænium* parvum, pallidum, glaberrimum, valde compressum, oblique obovoideum, margine subincrassato. Fl. masc. pauci, 5-dentati.

This belongs to the section with *V. attenuata*, DC., and is most nearly allied to an Abyssinian one called *V. inulæfolia*, Steud.

2. Adenostemma viscosum, *Forst.*

Hab. In Fernando Po, alt. 4–8000 ped. (fl. Dec.)

Herba 3–4-pedalis, corollis albis.

I believe that there is but one species of this genus in the Old World; it is a native of Abyssinia (*A. Schimperi*, C. H. Schultz), of South Africa, of all Tropical Asia and the Pacific Islands. The Fernando Po form is the common Indian one.

3. DICHROCEPHALA OBLONGA, *H.f.* Hispidulo-pilosa, caule tereti apice ramoso, foliis sessilibus patulis lineari- v. oblongo-lanceolatis acuminatis irregulariter pinnatifido-lobatis marginibus recurvis lobis subremotis incisis lobulis acutis v. mucronatis, capitulis late oblongis purpureis, involucri squamis 6–8 herbaceis pubescentibus, receptaculo columnari.

Hab. In cacumine Clarence Peak, alt. 10,700 ped. (fl. Dec.)

Herba erecta, rigidula, 1–2-pedalis. *Folia* 1½″–2″ long.; ⅓″–½″ lat. *Capitula* ¼″ long.—*D. chrysanthemifoliæ*, DC. (Abyssinica, C. H. Schultz) proxima, differt habitu rigido, caule simplici, foliis angustioribus rigidis acutius lobatis, et præcipue capitulis oblongis, involucro oligophyllo et receptaculo columnari.

The nearest ally of this is *D. chrysanthemifolia*, a native of Abyssinia and India.

4. HELICHRYSUM (XEROCHLÆNA) MANNII, *H.f.* Caule robusto villoso apice ramoso; foliis densissimis sessilibus, patulis demum reflexis, semiamplexicaulibus oblongo-lanceolatis acutis integerrimis enerviis subtus marginibusque tomento appresso niveis, pedunculis basi capitulisque magnis albis v. pallide stramineis foliaceo-bracteatis, involucri squamis numerosissimis hyalinis splendentibus acuminatis.

Hab. In cacumine Clarence Peak, alt. 10,000 ped. (fl. Dec.)

Herba robusta, dense foliosa, pedalis et ultra, tomentosa. *Caulis* strictus erectus, teres, simplex, densissime foliatus. *Folia* 2″–3″ long., ⅔″-lata, acuta et apiculata, inferiora supra glabrata, inferne dense appresse lanata, superiora utrinque laxius lanata v. araneosa. *Capitula* subpaniculatim corymbosa, bracteis foliaceis fere tecta, expansa 1¼′ lata, pedunculis araneosis bracteolatis. *Involucri* squamæ perplurimæ, multiseriatæ, suberectæ, flosculis ⅕″ excedentes, apicibus acuminatis vix recurvis, externæ araneosæ, ceteræ glaberrimæ, internæ minores et

angustiores late unguiculatæ, supra unguem purpureæ. *Receptaculum* convexiusculum, amplum, alveolatum. *Flosculi* numerosissimi. *Pappus* paucisetosus. *Corolla* anguste tubulosa. *Achænium* minimum glabriusculum.

A noble species, allied to *H. fœtidum*, but differing in the dense foliage, leaves less broad at the base, different form of inflorescence, which is more paniculate than corymbose, and much larger capitula.

5. Helichrysum (Xerochlæna) fœtidum. *Cass.*; *A. Rich. Flor. Abyss.* i. 426.

Hab. Ad Clarence Peak, alt. 10,000 ped. (fl. April.)

An extremely variable plant, native of Abyssinia, South Africa, Madagascar, and Mauritius, varying in breadth and tomentum of foliage, somewhat in size of the capitula, and much in their colour, from white to deep golden yellow.

6. Helichrysum (Chionostemma?) chrysocoma, *C. S. Schultz*; *A. Rich. Flor. Abyss.* i. 424. Var. *angustifolium*, gracile, foliis anguste lanceolatis acuminatis marginibus revolutis tomentosis v. superne glabratis; pappi setis albis.

Hab. Clarence Peak, alt. 10,000 ped. (fl. April.) *Herba* 4-pedalis.

I have examined several authentically named Abyssinian specimens of this plant, which present great variations in tomentum and breadth of foliage. The present differs from all in being rather more glabrous and slender, and smaller in foliage. The inflorescence, capitula, involucres, and florets are identical in all. The receptacle in all is covered with conical subulate elongate dark-yellow rigid bodies, that are persistent after the florets have fallen away. They are not noticed in A. Richard's work; these would refer this species to DeCandolle's section *Chionostemma*, were it not that the setæ of the pappus are quite free at the base. Richard describes the pappus as ferruginous, but it is white in all the Abyssinian specimens I have examined of Schimper's, and in the Fernando Po ones also.

7. Helichrysum (Achyrocline) Hochstetteri, *C. H. Schultz*; *A. Rich. Flor. Abyss.* i. 429.

Hab. Clarence Peak, alt. 8500 ped. (fl. Jan.) *Herba* 2-3-pedalis.

Mr. Mann's specimens are not a full flower, but the small size, great number and form of the capitula, the involucral scales, habit, tomentum, foliage and winged stems, leave no room to doubt that the present is identical with the Abyssinian plant, of which I have compared many specimens. The bruised capitula of the Abyssinian plant are aromatic, a character I do not observe in the Fernando Po, which are probably either too young, or, owing to the damp climate, deficient in aroma.

8. Helichrysum (Chionostemma?) globosum, *C. H. Schultz*; *A. Rich. Flor. Abyss.* i. 425.

Hab. Clarence Peak, alt. 10,000 ped.

Apparently identical with the Abyssinian plant.

9. Gynura vitellina, *Benth. in Niger Flora*, 438.

Hab. Fernando Po, ad 8500 ped. in Clarence Peak attingens. (fl. Dec.) First found in Fernando Po by Vogel, afterwards by Barter on the same island, and in Abyssinia by Dr. Roth. It is an instance of a mountain plant descending to the level of the sea at the base of the mountains, but not found elsewhere at the same level, on the African coast.

10. SENECIO (OBÆJACÆ) CLARENCEANA, *H.f.* Herbacea, erecta, glaberrima, caule folioso, foliis amplis patulis sessilibus lineari-oblongis, v. oblongo-lanceolatis obtusis basi auriculatis marginibus semipinnatifidis, lobis grosse dentatis, capitulis ($\frac{1}{2}''$ long.) corymbosis obconico-campanulatis gracile pedicellatis multifloris, involucri vix calyculati foliolis linearibus pedicellisque puberulis, flosculis omnibus tubulosis (sub 30–40), achæniis glabris.

Hab. Clarence Peak, alt. 9000 ped. (fl. Dec.)

Herba 2-pedalis, robusta, glabra nisi pedunculis pedicellis involucrisque puberulis. *Caulis* erectus, simplex. *Folia* 3″–5″ long., 1″ lat., subcarnosula, subtus pallidiora. *Corymbi* multiflori.

11. SENECIO (ARBORESCENTES) MANNII, *H.f.* Glaberrima, ramis apice foliatis teretibus cicatricatis, foliis breve petiolatis lanceolatis longe acuminatis dentatis costa nervisque subtus creberrimis pilosulis, paniculis terminalibus ramosis multifloris, ramis pedunculis pedicellisque gracilibus pubescentibus capitulis ($\frac{1}{3}''$ long.) angustis paucifloris, involucri squamis paucis erectis apice incurvis anguste linearibus basi bracteolatis.

Hab. Fernando Po, alt. 6000 ped. (fl. April.)

Arbor parva, 25′ alt., ramis crassiusculis. *Folia* spithamæa et ultra $1\frac{1}{2}''$ lat., petiolo vix 1″ long., membranacea, utrinque concolora, juniora parce ferrugineo-tomentella, nervis crebris subhorizontalibus. *Panicula* longiuscule pedunculata, 6″ alt., ramis subelongatis. *Involucri* squamæ (sub 5) angustæ, medio herbaceæ, acute carinatæ, marginibus late hyalinis, apicibus incrassatis. *Flosculi* sub 6, achæniis glabris.

A handsome species, resembling some of the Indian mountain forms.

LOBELIACEÆ & CAMPANULACEÆ.

1. LOBELIA (TUPA) COLUMNARIS, *H.f.* Tota pubescenti-tomentosa foliis confertis sessilibus anguste lanceolato-oblongis acutis irregulariter denticulatis subtus dense tomentosis, racemo elongato conico densifloro, floribus dense pubescentibus.

Hab. Clarence Peak. (fl. Dec.)

Herba robusta, ut videtur 3-4-pedalis, dense foliosa. *Caulis* crassus, simplex, diam. digiti majoris. *Folia* 4″–6″ long., $\frac{3}{4}''$–1″ lat., erecto-patentia, nervis crebre reticulata. *Racemus* 8″–12″ long. *Flores* densissime imbricati, $1\frac{1}{3}''$ long., angusti; alabastris cylindraceis, lente curvis. *Bracteæ* inferiores foliaceæ, flores subæquantes, superiores breviores. *Pedicelli* inferiores 1'' long. *Calycis* tubus hemisphæricus, lobis anguste lanceolato-subulatis, integerrimis, corollam triente brevioribus. *Corolla* lobis anguste ligulatis tubum æquantibus. *Staminum* tubus fere rectus, pubescens; antheris pilosis vix barbatis.

Closely allied to *Lobelia nicotianæfolia* of India. There are two Abyssinian allies, but no described South African, Mauritian or Madagascar.

2. WAHLENBERGIA POLYCLADA, *H. f.* Hispido-pilosa, superne glabra, caulibus e collo numerosissimis basi decumbentibus demum erectis apice dichotome ramosis floriferis, foliis (parvis) sessilibus oblongo- v. ovato-lanceolatis acutis integerrimis undulatis, floribus parvis, calyce longe obconico, corolla brevissima capsula biloculari.

Hab. Clarence Peak, ad declivum orientem alt. 9000 ped. (fl. Dec.)

Herba radice gracili. *Caules* spithamæi ad pedalem, inferne et folia pilis hispidulis subcrispatis laxiuscule vestiti, superne divisi, glaberrimi gracillimi. *Folia* $\frac{1}{4}''$–$\frac{1}{2}''$ long., basi obtusa v. subcordata, margine lente recurva. *Flores* $\frac{1}{3}''$ long.; calycis tubus anguste obconicus, lobis breviusculis, triangulari-lanceolatis. *Corolla* parva, cærulea, *calycis* lobos vix superans, an perfecta?

Not unlike *W. gracilis*, a very widely diffused Australian, Indian, &c. species, and of the same habit.

3. WAHLENBERGIA ARGUTA, *H. f.* Glabra, caulibus gracillimis elongatis ascendentibus, apice pedunculos elongatos dichotome ramosos gerentibus, foliis sessilibus lanceolatis acuminatis argute serratis, floribus mediocribus, calyce brevissime obconico, corolla campanulata, capsula semisupera 3-loculari.

Hab. In Clarence Peak, alt. 8500 ped. (fl. Dec.)

Herba gracillima, caulibus flexuosis pedalibus parce vage ramosis. *Folia* $\frac{1}{2}''$–$\frac{3}{4}''$ long., basi angustata, marginibus tenuiter recurvis. *Pedunculi* 3–4-pollicares, superne dichotome divisi, ad axillas bracteati, bracteis subulatis. *Flores* $\frac{1}{3}''$–$\frac{1}{2}''$ longi, suberecti. *Calycis* tubus brevissimus, lobis triangulari-lanceolatis, corolla pallide cærulea multoties brevioribus. *Capsula* trapezoidea semisupera.

The habit of this species is that of the St. Helena *W. angustifolia*, ADC, to which it is nearly allied, though the capsula is 3-celled.

ERICEÆ.

1. LEUCOTHOE ANGUSTIFOLIA, var. β. pyrifolia, *DC. Prodr.* i. 603.

Hab. In Clarence Peak, alt. 8500 ped. (fl. Dec.)

Arbor 15–20-pedalis, corolla rufo-ferruginea.

Apparently identical with the plant of Mauritius and Bourbon; it also inhabits Madagascar. The flower and fruit vary a good deal in size.

2. Blæria spicata, *Hochst.*; *A. Rich. Flor. Abyss.* ii. 13.

Hab. In cacumine Clarence Peak, alt. 10,700 ped. (fl. Dec.)

Fruticulus pedalis.

This is identical with the Abyssinian plant. The genus was previously supposed to be confined to South Africa and Abyssinia.

3. ERICINELLA MANNII, *H.f.* Ramulis puberulis, foliis appressis glabris nitidis, pedicellis folia superantibus, sepalis superioribus corolla dimidio brevioribus, antheris muticis inclusis, stylo breviter exserto.

Hab. Clarence Peak, alt. 10,000 ped. (fl. Dec.)

Frutex 10-pedalis.

Extremely closely allied to the South African *E. multiflora*, Kl., and Madagascar *E. gracilis*, Benth., and almost intermediate between these, though quite distinct from both. It differs from *gracilis* in the pubescence, white stems and branches, longer pedicels and shorter sepals; from *E. multiflora* in the longer pedicels, erect leaves, muticous anthers and short style.

LOGANIACEÆ.

1. ANTHOCLEISTA SCANDENS, *H.f.* Caule tetragono, foliis petiolatis obovatis apiculatis, petiolis non alatis basi exauriculatis, corolla 12-mera, antheris fauce corollæ sessilibus.

Hab. Clarence Peak, alt. 5000 ped. (fl. Dec.)

Arbor scandens, 50-pedalis. *Ramuli* non spinosi. *Folia* 3″–4″ long., petiolo pollicari. *Calyx* fere 1″ long. *Corolla* 2″ expans. *Bacca* obovoidea, 2-pollicaris.

A very distinct species from *A. Vogelii* or *nobilis*, with flowers twice as large, leaves not half as large, sessile anthers, and a much larger berry.

GENTIANEÆ.

1. Sebæa brachyphylla, *Griseb.*; *DC. Prodr.* ix. 53.

Hab. Clarence Peak, 8500—10,000 ped. (fl. Dec.)

Herba 1–1½-pedalis, floribus flavis.

Appears identical with the Madagascar plant.

2. SWERTIA CLARENCEANA, *H.f.* Glaberrima, caule erecto anguste alato, foliis cordato-subrotundis obtusis margine recurvis, sepalis oblongis obtusis corolla dimidio brevioribus, corollæ lobis obovato-oblongis obtusis, staminibus 5, foveæ nectariferæ marginibus fimbriatis.

Hab. Ad cacumen ipsum Clarence Peak, alt. 10,700 ped. Exempl. solitarium. (fl. Dec.)

Herba 6″ alt. subrobusta, caulis alæ angustæ, interdum margine subglanduloso-denticulata. *Folia* ⅓″ long. *Flores* laxe cymosi, pro planta majusculi, fere ¾″ expans.

Very nearly allied to *S. Abyssinica*, but differs in more stout habit and much larger flowers.

MYRSINEÆ.

1. Mæsa Indica, *ADC.*; *Prodr.* viii. 80.

Hab. Fernando Po, alt. 5000 ped. (fl. Nov.)

Arbor parva, 15–20-pedalis.

This does not differ from the Indian plant, which is found from the Himalaya to Australia. It is also very similar to a Natal and East African species, with ciliated panicles. The *M. lanceolata* of Abyssinia differs more in texture and size than any floral characters.

LABIATÆ.

1. PLECTRANTHUS (COLEOIDES) GLANDULOSUS, *H.f.* Herbaceus superne glanduloso-pilosus, foliis petiolatis ovato-cordatis acutis grosse crenatis crenis crenulatis membranaceis, racemis laxe paniculatis, paniculæ ramis patentibus paucifloris, pedicellis gracilibus, corollæ defractæ labio inferiore porrecto saccato.

Hab. In Clarence Peak, alt. 7000 ped. (fl. April.)

Herba diffuse ramosa, 8-pedalis. *Rami* graciles, obtuse tetragoni, superne cum petiolis et inflorescentia glandulosi. *Folia* patentia longe petiolata, 3″-5″ long., 2″-4″ lat., supra glabra, subtus ad nervos pilosula, petiolis 2″-3″ long. *Panicula* ampla, laxa, divaricatim ramosa. *Verticillastra* pauciflora, floribus gracile pedicellatis in pedunculo communi gracili ternis. *Calyx* breviusculus, labio superiore brevi 1-lobo recurvo, inferiore longiore 4-fido lobis subulatis. *Corolla* cærulea, fere $\frac{2}{3}$″ long., labio superiore reflexo, inferiore cymbiformi obtuso.

This has near allies both in South Africa, Abyssinia, Madagascar, and India: it differs from the technical character of the *Coleoideæ* in the pedicelled flowers.

2. PLECTRANTHUS (INDI) RAMOSISSIMUS, *H.f.* Pubescente-pilosa v. tomentosa, caule herbaceo erecto, ramis divaricatis, foliis petiolatis ovato-lanceolatis acutis crenatis utrinque pubescenti-pilosis, floralibus similibus sessilibus, cymis evolutis secus ramulos floriferos seriatim dispositis, pedunculis gracilibus apice ramosis 10-12-floris, calycibus villosis canis parvis, corollæ tubo pubescente recto.

Hab. In Fernando Po, alt. 5000 ped. (fl. Dec.)

Herba 6-pedalis, gracilis, divaricatim ramosissima, caulibus ramisque pilis subferrugineis sæpe deflexis vestitis. *Folia* $1\frac{1}{2}$″-2″ longa. *Rami* floriferi 6″-10″ long. *Cymæ* pedunculi patentes, graciles, $\frac{1}{2}$″-$\frac{3}{4}$″ long., apice bracteas 2 patentes subulatas gerentes. *Flores* parvi, $\frac{1}{4}$″ long. *Calycis* tubus canus, basi hemisphæricus, ore obliquo contracto. *Corolla* calyce ter longior, alba, recta v. lente curva, lobis subæqualibus recurvis, genitalibus longe exsertis.

All the other African plants of this section (Cape, Madagascar and Abyssinia) belong to a group in which the cymes are crowded and nearly sessile, with the corolla tube defracted. The present is much more closely allied to several mountain Indian species.

3. Pycnostachys Abyssinica, *Fresen. Flora*, 1838, ii. 608.

Hab. Fernando Po, alt. 700 ped. (fl. Dec.)

Herba 8-pedalis, corolla violacea.

Judging from the short description of Fresenius in the 'Flora,' this is

certainly his plant. It differs from its very near ally *P. cærulea* of Abyssinia in the large flowers and calyx and dense pubescence; from the Cape *P. reticulata* in the petiolate and broader leaves.

4. Calamintha Simensis, *Benth. in DC. Prodr.* xii. 230.

Hab. Clarence Peak. alt. 8500 ped. (fl. Dec.)

Herba 2-pedalis, corolla purpurea.

This in no way differs from Abyssinian specimens, and is very nearly allied to the European *C. Acinus,* Benth.

5. STACHYS (STACHYOTYPUS) ACULEOLATA, *H.f.* Caule tenui procumbente elongato petiolisque retrorsum aculeolatis, foliis petiolatis ovato-cordatis obtusis grosse crenatis, verticillastris sessilibus sub 3-floris, floribus breve pedicellatis, calyce obconico subæqualiter 5-dentato lobis spinulosis, corolla tubo exserto, labio inferiore porrecto amplo trilobo lobo medio bilobo.

Hab. Clarence Peak, alt. 9000 ped. (fl. Dec.)

Herba parce ramosa, 1′–2′ longa. *Folia* distantia, 1″–1½″ longa, fere æquilata, petiolo pollicari. *Verticillastra* pauca, distantia, axillaria. *Flores* ½″ long., pallido purpurei tubo longe supra basin intus barbato, extus piloso. *Antheræ* divaricatæ.

This is the same with an undescribed Abyssinian species collected by Dr. Roth; but the stem is more slender, the petioles longer, the calyx rather smaller; I have no corolla in the Abyssinian specimen.

SOLANEÆ.

1. Solanum Indicum, *L.* Var. *micranthum.*

Hab. Fernando Po, alt. 6000 ped.

Frutex 6–8-pedalis, floribus albis.

Common throughout Tropical Africa, and probably not different from *S. Adoense* of Abyssinia.

ACANTHACEÆ.

1. Dicliptera maculata, *Nees.?* *A. Rich. Fl. Abyss.* ii. 158.

Var. Glanduloso-pilosa, floribus majoribus.

Hab. Fernando Po, alt. 5000 ped. (fl. Dec.)

Scandens 20-pedalis, corolla alba.

Apparently quite the same as the Abyssinian plant, but the flowers are either larger or owe their appearance of being so to better drying. In the Fernando specimens all parts are pilose and glandulose, in Abyssinian ones glabrous, but in A. Richard's character they are stated to be covered with cottony hairs. In the Fernando Po and one Abyssinian specimen the involucral leaves are quite obtuse and muticous, in another Abyssinian they are obscurely mucronate, and in a third ovate and pungent. Perhaps more than one species is included under this name.

SCROPHULARINEÆ.

1. Limosella aquatica, *L.* Var. *tenuifolia.*

Hab. Clarence Peak, alt. 9000–10,000 ped. locis humidis. (fl. Dec.,

This is an American, Australian, and South African form; the Abyssinian is the common European one, which also grows in South Africa.

2. VERONICA (VERONICASTRUM) MANNII, *H.f.* Caule e basi decumbente erecto simpliciusculo bifariam pubescente foliato, foliis sessilibus oblongo-lanceolatis remotiuscule serrulatis acutis, racemo terminali conferto glanduloso-tomentoso, staminibus corolla brevioribus, capsula orbiculata emarginata.

Hab. Ad cacumen Clarence Peak, alt. 10,700 ped. (fl. Dec.)

Herba gracilis, pedalis. *Caule* tereti basi radicante. *Folia* $\frac{2}{3}''$ long., subcoriacea. *Racemus* brevis v. elongatus. *Flores* breve pedicellati, cærulei $\frac{1}{3}''$ expans. *Calycis* lobi oblongi, obtusi, capsulam æquantes.

Very nearly allied to *V. glandulosa*, Hochst., of Abyssinia, but, as far as the several excellent specimens of both show, quite distinct in the narrow leaves and sepals, and bracts shorter than the flowers. It may well, however, prove to be a variety of that plant.

PLANTAGINEÆ.

1. PLANTAGO (LEPTOSTACHYS) PALMATA, *H.f.* Rhizomate perenni horizontali, foliis longe petiolatis late cordato-orbiculatis palmatim 5–7 lobis, spica gracili, capsulis dispermis.

Hab. Clarence Peak, alt. 8000 ped. (fl. Dec.)

Glabra v. parce pilosa. *Rhizoma* crassum, fibras rigidas demittens, collo brevi. *Peticli* 4''–6'' longi, glabriusculi, apice dilatati. *Folia* 2''–3'' long. et lat., membranacea, nervis radiantibus. Scapi petiolis subbreviores. *Flores* inter minores, laxe imbricati, basi laxe barbati. *Bracteolæ* et sepala consimilia obtusæ oblongæ dorso medio herbaceæ late scarioso-marginatæ, glabræ v. parce pilosæ. *Corolla* parva, genitalibus longe exsertis. *Capsula* calycem paulo superans. *Semina* viridia, crassiuscula, cymbiformia.

A very remarkable species in the form of the leaf.

SANTALACEÆ.

1. THESIUM (EUTHESIUM) TENUISSIMUM, *H.f.* Ramis e collo perplurimis ramulosis ramulisque gracillimis glaberrimis sulcatis, racemo ramoso, bracteolis 2 bracteam superantibus perianthio dimidio brevioribus ovato-subulatis, perianthii subcampanulati 4-5-fidi lobis inflexis exauriculatis, stylo stamina attingente, stigmate capitellato.

Hab. Ad Clarence Peak, alt. 9000 ped. (fl. Dec.)

Radix elongatus, teres, crass. pennæ corvinæ. *Rami* 4''–6'', gracillimi, angulati, squamulis minutis raris subulatis aucti. *Racemi* rami pauci breviusculi fasciculis sub 3-floris. *Bracteæ* et *bracteolæ* carinatæ ob-

scure ciliatæ. *Perianthium* $\frac{1}{8}''$ long. obscure et obtuse angulatum, lobis breviusculis glaberrimis v. margine obscure ciliatis. *Filamenta* ori inserta, antheris duplo longiora.

Very nearly allied indeed to *T. Madagascarense*, A. DC., which is the only other species of this vast genus in which the bracteolæ exceed the bracts, and the stems are almost leafless. It differs remarkably from that plant in size, in the very numerous very slender stems and branches, and much smaller flowers.

THYMELEÆ.

1. PEDDIEA PARVIFLORA, *H.f.* Stamina ori perianthii inserta, ovarium apice villosum.

Hab. Fernando Po, alt. 5000 ped. (fl. Nov.)

Arbor 15–20-pedalis, floribus viridibus.—*P. Africanæ*, Harv., simillima, differt ramis gracilibus foliis magis membranaceis, floribus duplo minoribus, staminibus ori perianthii insertis, ovarioque apice toto villoso.

The only congener of this is a subtropical Port Natal tree.

URTICEÆ.

1. Parietaria Mauritanica, *Wedd.*

Hab. Clarence Peak, alt. 8000 ped. (fl. Dec.)

Herba 6-8 pedalis.

The bracts are decidedly ovate, though narrower than usual in this form which seems to pass into *P. debilis*, Forst.; it is described by Weddell as a Mediterranean and North African species.

EUPHORBIACEÆ.

1. EUPHORBIA (ESULA) AMPLA, *H.f.* Herbacea, glaberrima, foliosa; caule simplici superne patentim ramoso, foliis membranaceis petiolatis lanceolatis acutis subtus glaucescentibus, floralibus late ovato-cordatis v. triangulari-ovatis acuminatis, involucris solitariis laminis fimbriatis, glandulis semilinearibus cornubus brevibus.

Hab. In Clarence Peak, alt. 8500 ped. (fl. Dec.)

Herba 4-pedalis, caule crassiusculo, terete, inferne nudo. *Rami* patentes, conferti, spithamei et ultra, foliosi, terminalibus divaricatis. *Folia* 4″–5″ long., $\frac{3}{4}''$–1″ lat., integerrima, tenuiter nervosa, nervis divaricatis. *Involucra* sparsa, minima, solitaria. *Stamina* sub 8.

The habit of this species resembles *E. Lathyris*, but the whole plant is of a totally different texture; it is most near *E. monticola*, Hochst., of Abyssinia, but has not the involucral glands produced into subulate horns as in that plant. It is also allied to the Indian *E. Rothiana*; but in that the inflorescence is borne on peduncled special branches, and the involucres are numerous.

2. CLAOXYLON (ATHROANDRA) MANNII, *H.f.* Glaberrimum, gemmis

perulatis, foliis alternis petiolatis lanceolatis acuminatis irregulariter sinuoso-serratis basi biglandulosis, fl. masc. laxe paniculatis, gracile pedicellatis, perianthio late campanulato 4–5 fido lobis triangularibus valvatis, antheris numerosissimis in globum supra receptaculum aggregatis, fl. fœm. perianthio 2-lobo, glandulis 2-lobis alternantibus, ovario 2-loculari, stigmatibus elongatis.

Hab. Fernando Po, alt. 5000 ped. (fl. Dec.)

Frutex 15-pedalis, ramis fragilibus teretibus. *Gemmæ* in axillis foliorum brevibus squamulis late obovatis rigide coriaceis pallidis nitidis tectæ. *Folia* spithamæa, membranacea, basi 3-nervia, petiolo pollicari. *Racemi* axillares et cum ramulis e gemmis orti, petiolis breviores v. æquilongi, pedunculo gracillimo, floribus paucis subcorymbosis gracile pedicellatis, pedicellis $\frac{1}{4}''$–$\frac{1}{3}''$ long. *Alabastra* late ovoidea. *Flores* virides, $\frac{1}{4}''$ diam. *Antheræ* numerosissimæ, sessiles, squamulis non immixtæ, loculis globosis. *Fl. fœm.* parvi, perianthii lobis parvis minutis oblongis. *Styli* recurvi, elongati.

A very singular plant, probably generically distinct from *Claoxylon*, from all other species of which the perulate buds abundantly distinguish it. A very similar species was found in the Niger by Barter.* The structure of the flower agrees with the character of *C. cordifolium*, Benth., but in that the anthers are sessile. The name of *Athroandra*, signifying crowded stamens, will serve to distinguish these species whether as genus or section.

COMMELYNACEÆ.

1. Cyanotis Abyssinica, *A. Rich.?* *Flor. Abyss.* ii. 344.

Hab. Clarence Peak, alt. 9000 ped. (fl. Dec.)

A fine species, remarkable for its round tuberous roots, the size of a hazel nut. It may be the same with a Madagascar and South African species, but the extremely fugacious flowers are very difficult of analysis, and judging from dried specimens, I hardly think them the same.

ORCHIDEÆ.

[By Dr. Lindley.]

1. Calanthe, sp. nov.? C. Natalensi, *Reich.*, proxima.

Hab. In Clarence Peak, alt. 6000 ped.

Herba $1\frac{1}{2}''$ alt. Corolla alba et purpurea.

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* *Claoxylon* (*Athroandra*) *Barteri*, H. f. Glabrum, gemmis perulatis, foliis ovato-lanceolatis abrupte acuminatis crenatis junioribus pilosis basi eglandulosis, fl. masc. parvis in pedunculum brevem gracilem sessilibus v. pedicellatis, perianthio 4-lobo, lobis valvatis, antheris ut in *C. Mannii*. *Fl. fœm.* stigmatibus parvis.

Hab. Flum. Niger ad Gomba, Eppah et Lagos,—beat. *Barter*. *C. Mannii* arcte affinis, differt foliis latioribus, parvis, 1″–2″ long. obsolete acuminatis basi non biglandulosis, floribus multoties minoribus et stylis brevibus.

2. Habenaria, sp. nov. H. peristyloides, *A. R.* (Abyssiniæ) et *H. prœaltæ Thouars* affinis.

Hab. Ad cacumen Clarence Peak.

3. Polystachya?

Hab. Clarence Peak, alt. 6000 ped.

Epiphytica, species singularis et distinctissima. *P. capensi,* Sond., et *Ottonianæ,* Reichb., habitu similis.

4. Bolbophyllum, sp. nov.

Hab. Clarence Peak, alt. 5000 ped.

Epiphytica, *B. flavido* (Sierra Leone) affine.

JUNCEÆ.

1. Luzula campestris, *L.*

Hab. Ad cacumen Clarence Peak, alt. 10,700 ped. (fl. Dec.)

I have seen no other Tropical African specimens of this plant, nor is any species of the genus mentioned in Richard's 'Flora of Abyssinia.' There is, however, a very similar plant in South Africa.

CYPERACEÆ.

1. Carex Boryana, Schkuhr. Forma spica depauperata. (*Boott.*)

Hab. Clarence Peak, 8500 ped. (fl. Dec.)

Dr. Boott, who has identified this and the following for me, observes that he has a similar form from Bourbon, of which isle and Abyssinia this is a native.

2. Carex Wahlenbergiana, *Boott.* Illust. Carex, t. 301.

Hab. Clarence Peak, alt. 8000 ped. (fl. Dec.)

Of these specimens Dr. Boott remarks, that it has pale spikes, and shorter narrower bracts and leaves than the fully developed plants; but that he has the same pale spikes and narrow (but longer) leaves in Bourbon specimens. It is also a native of Mauritius.

3. Kyllingia macrocephala, *A. Rich. Flor. Abyss.* ii. 491.

Hab. Clarence Peak, alt. 8500 ped. (fl. Dec.)

I am very doubtful if this is anything but a form of the ubiquitous *K. monocephala*: the scales are however larger and of a somewhat different shape. Stamens 2.

4. Isolepis trifida: cf. T. pusilla, *Hochst.*, et T. gracillima, *Hochst.*

Hab. Ad cacumen Clarence Peak, alt. 10,700 ped. (fl. Dec.)

A common Indian plant, extending westward to Abyssinia and Senegal, and eastward to China.

5. SCHŒNUS? ERRATICUS, *H.f.* Pusillus, glaberrimus, rigidulus, caule basi bulboso, foliis filiformi-setaceis rigidis curvis supra canaliculatis subtus convexis, culmis nudis curvis filiformibus sulcatis apice monocephalis, capitulo ovoideo compresso e spiculis 1–3 piceis compressis

composito, involucro 1–3-phyllo spiculis breviore, foliolis ovato-lanceolatis acuminatis dorso carinatis, spiculis 5 8 lineari-oblongis compressis vix distiche imbricatis.

Hab. Clarence Peak, alt. 9000 ped. (fl. Dec.)

Herba 3–6-uncialis, culmis basi subbulbosis folia longe superantibus. *Folia* 1–2 pollicaria sulcata, acuminata, vix $\frac{1}{4}'''$ diam. vaginis brevibus rufis non nitentibus. *Capitulum* $\frac{1}{2}''$ long. *Spiculæ* confertæ, lineari-oblongæ, squamæ sub 8–10, infimæ paucæ latiores vacuæ, cæteræ subæquilongæ, oblongo-lanceolatæ, acutæ, vix carinatæ, opacæ, glaberrimæ. *Stamina* 3, discus et setæ hypogynæ 0. *Ovarium* parvum oblongum trigonum, stylo gracili basi simplice, stigmatibus 3 filiformibus.

I am doubtful of the genus of this plant; the scarcely distichous scales of the spikelet differing from *Schœnus*, to which it is otherwise referable. The scales are, however, not always regular in *Schœnus nigricans*, and in *Chætospora*, which must surely be reduced to *Schœnus*, the scales are sometimes imbricated all round. A. Richard's *Hemichlæna bulbosa*, to which this is a good deal allied, has distichous scales, but this plant differs materially from *Hemichlæna* in wanting the disk. I do not see how it differs from *Cyperus*, with many species of which it further agrees in the margins of the scales decurrent on the rachis.

GRAMINEÆ.

1. Deschampsia cæspitosa, *P.B.* *D. latifolia*, Hochst.; A. Rich. Flor. Abyss. ii. 413.

Hab. Clarence Peak, alt. 10,100 ped.

Also found in Abyssinia and most other temperate parts of the globe, but not hitherto in South Africa.

2. Trisetum lachnanthum, *Hochst.*; *A. Richard. Flor. Abyss.* ii. 416.

Hab. Clarence Peak, alt. 7900–9000 ped. (fl. Dec.)

A very distinct species, closely allied to *T. virens*, Nees, of the Indian mountains.

3. Festuca Schimperiana, *A. Rich.* *Flor. Abyss.* ii. 433.

Hab. Clarence Peak, alt. 8500 ped. (fl. Dec.)

The spikelets are rather larger than in the Abyssinian specimens, but the species is evidently the same.

4. Brachypodum sylvaticum, *R. & S.*

Hab. Clarence Peak, alt. 7000 ped.

A native of Abyssinia (*B. flexum*, Nees).

5. Gymnandropogon, sp.? (*Schimper, Plant. Abyss.* 1853, No. 1006.)

Hab. Clarence Peak, alt. 9000 ped. (fl. Dec.)

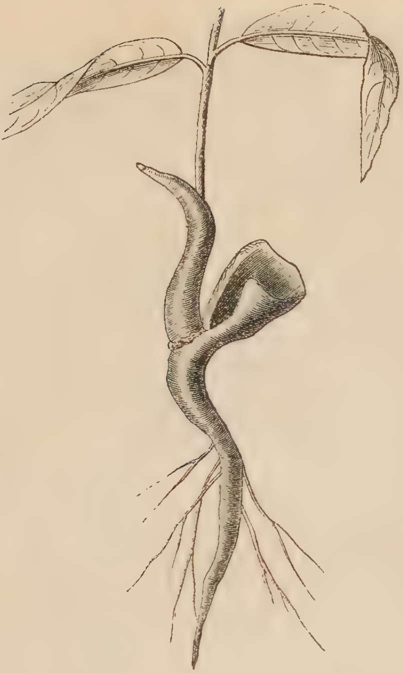
This, which approaches very closely *A. glabriusculus*, Hochst., of Abyssinia, further seems identical with another and perhaps undescribed species of that genus, collected by Schimper, and quoted above.

Note on an unusual mode of Germination in the Mango—*Mangifera Indica.* By MAXWELL T. MASTERS, Esq., F.L.S.

[Read April 4th, 1861.]

IN the Museum of the Royal Gardens at Kew, are preserved two specimens of the Mango in an advanced stage of germination, which present some peculiarities that may be deemed worthy of bringing under the notice of the Society. For the opportunity of examining and describing these curious plants, I am under great obligations to Dr. Hooker, and to Mr. Jackson the curator of the Museum. From these gentlemen I learn that the seeds in question were sent home by the late Mr. Barter, when accompanying Dr. Baikie on his second Niger Expedition in 1857, and were reared by Mr. Crocker at Kew.

From the appearance that these young plants presented on cursory inspection, and perhaps from the knowledge that the seeds of the Mango are occasionally poly-embryonous, the specimens were described in these words, "one mango seed producing many plants." The closer examination which I have been enabled to make leads me to conclude that there are, in reality, two seeds, presenting such peculiar appearances, especially when placed, as they were, in close apposition one to the other, as readily to give rise to the opinion before expressed. This will be understood at once by the circumstance of there being only two cotyledons present, from between which a great number of shoots apparently emerge. In one of these two seeds (*fig.* 1.) one cotyledon is present, though partly decayed and truncated at its upper part, possibly by some accident during growth; the other seed-leaf is absent, but there is a scar distinctly visible, indicating its original position. The plumule presents itself as a long, thick, fleshy, curved body, presenting no trace externally of leaves or buds; in the axil of the cotyledon, between it and the plumule, arises a leaf-bearing shoot, presenting no unusual features. The radicle is thick and tapering, and gives off a few slender rootlets. The second seed (*fig.* 2) is likewise deprived of one of its cotyledons, but the scar remains to attest its former presence. From the appearance of the tissues in the immediate vicinity of the scar, the missing seed-leaf seems to have perished from some cause inducing gradual decay, rather than from any injury or traumatic cause, to use a surgical expression. The existing cotyledon is oblong, oblique at the base, the outer surface convex, wrinkled on the upper half, while the lower half is scooped out and smooth like the inside of a shell. From this portion proceed



ig. 1.

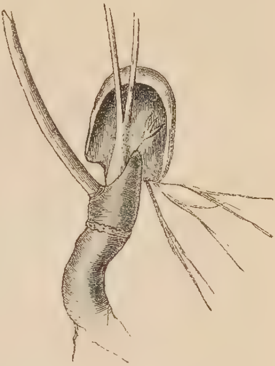


Fig. 3.

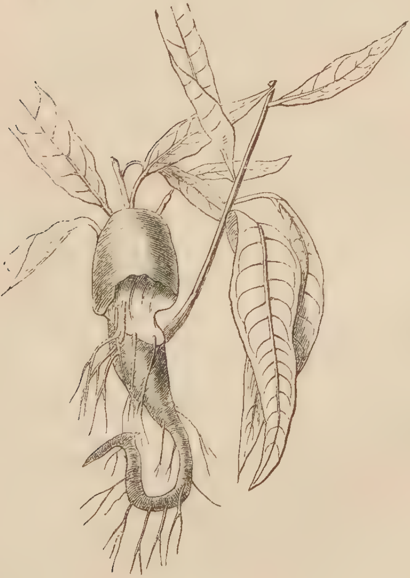


Fig. 2.

Fig. 2 outer } aspect of same seed. See reference on other side.
Fig. 3 inner }

a number of adventitious roots. The inner surface (fig. 3) is concave, and offers no unusual appearance; the plumule in this instance is short, thick, fleshy, conical, and gives off, not from its summit, but from its side, some distance above the attachment of the cotyledons, three leafy shoots, one of which is small and but slightly developed, and another is divided into two branches a short distance above its origin. The radicle has a similar appearance to that of the first-mentioned seed.

To sum up the peculiarities presented by these specimens, there is, first, the entire absence of one of the cotyledons in both instances; next, the peculiarity of the plumule, in the one case giving off no shoot at all, in the other giving rise to three shoots from its side; and, lastly, there is the production of adventitious roots from the "scooped-out" portion of the cotyledon.

I do not know any instance of plumules presenting the peculiarities just mentioned, nor have I been able to find on record any case of adventitious roots springing from the cotyledons themselves, though there is no physiological or anatomical reason why, under certain circumstances, adventitious roots should not be developed in such a situation. Irmisch indeed describes similar rootlets arising from the petiole of the cotyledon in *Bunium creticum* and *Carum Bulbocastanum**.

The scooping out of the lower half of the outer surface of the cotyledon may not be an unusual occurrence in mango seeds, though it is certainly not invariable. Griffith describes the cotyledons of this plant as oblique at the base, with half of their outer surface wrinkled, half smooth, sometimes auricled, sometimes not, sometimes of different sizes. The plumule he describes as "stalked and well-marked." Gaertner figures seeds of this plant with apparently lobed cotyledons, the lobes being, as Reinwardt† shows, really separate seed-leaves belonging to distinct embryos; but the descriptions given by these writers by no means apply to the cases I have attempted to describe; nor does Alexander Braun, in his recently published memoir on 'Polyembryonous Plants,' among which mention is made of the Mango, describe anything like them.

* Flora, 1858, pp. 33-42.

† Reinwardt, Nov. Act. Acad. Car. Leop. Nat. Cur. 9-24, 4to, 12, 1, 37.

REFERENCE TO THE WOODCUTS.

The figures are one half the size of the originals; Nos. 2 and 3 refer to the outer and inner aspect of the same seed respectively, but the details of the foliage, etc., are omitted in No. 3.

Account of the Ascent of Clarence Peak, Fernando Po, altitude 10,700 feet. By Mr. Gustav Mann, Botanist to Dr. Baikie's Niger Expedition. In a Letter to Sir W. J. Hooker, F.R.S., F.L.S., &c., and communicated by him.

[Read March 7, 1861.]

Sir,—As I informed you already in my letter before last, that I did not succeed at my first trial in ascending the mountain, I will give you now an account of my second trip, which was successful. On the 23rd of March I left Clarence for the second time, and commenced my ascent from here, keeping first eastwards and then turning south, and attaining the first day a height of 1300 feet. After I had passed two large Boobee towns, Barapa and Basile, finding the vegetation already quite different, I stopped to collect the few plants in blossom, and some nice Ferns, especially Trichomanes and Aspleniums. The trees were much overgrown by Orchids, Ferns, and Begonias, while moss hung a foot in length from the branches: there was in consequence much dry wood at the top of the trees. There were no Palms, nor herbaceous plants 15 feet high, as in the lower part. The temperature here in the mornings was 64°, at noon 70°, and in the evenings 66° Fahr. At about 1000 feet up I found the fine large Trichomanes growing on the ground, and the large Acrosticum?: these I sent in the Wardian case, and have dried specimens of both still here.

On the 27th of March I ascended to a height of 5000 feet: during this ascent I found the fine Cyathea. This species seems to form larger groups than other Cyatheas do, many averaging from 10–15 trunks, some of which rise to a height of 30 feet. The Onychium? of which I sent a specimen in the Wardian case, grows only as an epiphyte on this tree-fern. I also found on this ascent the fine Antrophyum?, resembling the Platycerium of the tropical part of the island; and the Liliaceæ, of which I sent six bulbs; and the Calanthe like Veratrifolia. All the Trichomanes grew between 1000 and 5000 feet. At this height I stopped one day, and ascended on the 28th to a height of 6000 feet, and on the 29th to 8500 feet; up to which height I found very little difference in the vegetation. From this place I was obliged to send a Krooman down to fetch more provisions, which, together with daily rain, obliged me to remain here six days. During this time I was compelled to sleep on the wet ground, placing my blanket and other things under an oil-cloth when the rain commenced at night, and selecting for myself a dry place where the rain did not come through the small roof of palm-leaves. This, under a temperature of 42° Fahr. at night, was a trial to my health; but one must learn everywhere, and I have learnt a great deal since I came here. The vegetation here consists mostly of herbaceous plants, as Gramineæ, Salvia, Rubus, &c. The largest trees here (50 feet high) are Araliaceæ and Compositæ. On the 3rd of April I reached the top, about two o'clock in the afternoon. Unfortunately a storm of rain and hail spoilt the enjoyment with which I should otherwise have seen the whole island spread out before me; but what was worse than this, I found the entire summit burnt, and no vegetation except grass, which was just beginning to sprout. This is done by the Boobees, to drive the deer to the lower part of the island. I did not meet with a Boobee above 1000 feet elevation. The top is formed by the highest side of the largest crater, which is about 40 feet deep. There is good and deep soil up to the top, and only on the inside of the largest crater are a few rocks visible. Lower down there are more small craters. At this time the temperature was 54° F., and the minimum at night 39° F.

Shrubs grow to between 400 and 500 feet of the top, and amongst them I found an Erica 8–10 feet high, which gave me much pleasure. I regret very much that I could not stop some days longer, but I ran the risk of making myself a cripple for life; I therefore commenced my descent on the 4th. Again it was too late in the season, for which reason very few plants were in blossom.

At the bottom of the highest part I found a small lake, perhaps only the result of the very heavy rain of the last few days. The large Hypericum forms the greatest part of the bush, and has a very pretty appearance from its fine light-green foliage. The first day I descended to 5000 feet, and on the 5th I went down to 1300 feet, where I remained six days, making excursions in different directions. The tree-fern and other living plants were collected the day before I set off on my return to Clarence, which place I reached on the 13th of April, and immediately commenced the arrangement of my plants, &c., being anxious to send away my collections by the last mail. After coming down from the mountain I needed a little rest, but having this work before me, I rather overworked myself, and took fever, which was the reason why I did not write to you by the last mail. I should be very glad to hear how the plants and specimens reached Kew, and if all was done to your satisfaction. It would also give me much pleasure if I heard that there was anything new among them. Yesterday I obtained a fruit spike of *Raphia vinifera*, 6 feet long, and so heavy that two men could scarcely carry it. Raphia is scarce on this part of the island, but is more abundant on the eastern side, because that part is lower, and this palm prefers a low swampy situation. It is much used, all the houses being roofed with its leaves. Next time I will send you some mats made from it, as they may be of interest for the Museum. At the north-west bay of the island an excellent sort of yam grows, quite like a good potato; on the eastern side they grow much larger, but are not nearly so good in quality. On the eastern side I also found good cotton, growing quite wild, and only gathered by the people when they have nothing else to do.

The whole island is uncultivated, with the exception of a small part near Clarence, for the yam-fields can scarcely be considered as cultivation. From February until now is the active time of year. In February the Boobees plant their yams, and in March the palm-oil season commences: the men bring home the nuts, and the women make and sell the oil. The island would yield ten times as much palm-oil, if the Boobees would make use of all that is growing; but these people have so few necessaries of life that they are not to be depended on.

To ascend the mountain one needs a good oiled tent with a hammock, and tin boxes to put everything in: an hour after I had dried my plants by the fire they were wet again, and I had therefore great difficulty in preserving them. It also requires at least six Kroomen to assist in the dry season. I have now quite recovered my health, and hope shortly to benefit by change of air when the ship goes up the river. I never thought that the difference of climate on the mountain and here would have had so much effect on me. On the mountain I enjoyed good health, except that I took a bad cold, from not having a sheltered place at night. By this mail I expected instructions from the Foreign Office, since till now I have received none at all, except that money has been granted to live on, and to go up the mountain, and for one Krooman to assist me. If the Expedition goes up the Niger again (which is doubtful), the collections will be entirely different.

I enclose a little sketch of the Consulate, thinking it may be of interest to you. Consul Hutchinson and his lady are going home to England; I shall thus lose a very kind friend, who has been like a brother to me. I heard from Mr. Hewen that you had inquired if it were possible to ascend the mountain of Bimbia or Cameron. You will hear shortly that it is quite impossible, and only killing men to send them up there; this, however, was also told me before I went up Clarence Peak. It is, no doubt, *very* difficult, but it is possible; only too much must not be expected from the first trip. Much might be gained by a second ascent; as would also, I think, be the case, if I could ascend the Peak here again, and remain there for some months during the dry season. To stop there in the wet season is quite impossible, and would be certain death.

GUSTAV MANN.

Clarence, Fernando Po,
May 31st, 1860.

On the Discovery of *Carex ericetorum*, Poll., as a Native of Britain. By CHARLES C. BABINGTON, M.A., F.R.S., F.L.S., Professor of Botany in the University of Cambridge.

[Read June 20, 1861.]

SEVERAL months since my friend Mr. John Ball, F.L.S., sent to me a specimen of *Carex*, gathered by him on the Gogmagog Hills in Cambridgeshire in the year 1838, and upon a careful examination of my Herbarium I found four specimens of the same plant, gathered at the same place on May 3, 1838, and probably in company with Mr. Ball. This plant was supposed by Dr. Boott to be the *C. ericetorum*, Poll. On referring to my notes I was enabled to ascertain the places visited on the above-mentioned day, and have lately revisited them more than once. At length, on May 28, 1861, I was so fortunate as to rediscover a single rather large patch of the same *Carex*, growing on the grassy slope of the Roman road, locally called the Wool Street, at about four miles and a half from Cambridge, and probably not far from the spot where it was gathered in 1838.

As I have now no doubt of its being the *C. ericetorum*, and a true native of the country, I venture to announce it as an addition to the British flora. This is no "split" from a recognized species, but a plant allowed by botanists to be a true species. At first sight it much resembles *C. præcox*, and inhabiting similar ground, may have been overlooked in many places. To the practised eye it has a decidedly different appearance when growing;

for the white edge of the scales of both kinds of its spikes gives it a silvery look very different from the dark hue of the *C. præcox*. The place where it grows is chalky and very dry, and there is an abundance of *C. præcox* in its neighbourhood. Although I have as yet only met with one patch of it, its restriction to that one spot is highly improbable; but unfortunately the chalk district of Cambridgeshire is so universally under the plough that few fit places for its growth now remain. It should be carefully looked for in similar places elsewhere in the south-east of England.

It may be known by the following characters:—Its fertile spikes are more ovoid and closer together than those of *C. præcox*; its glumes obovate, very blunt, with a pale margin, which is finely ciliated, especially at their tip; their midrib does not reach to the tip; its fruit is obovate. The nut I have not been able to examine, owing to the young state of the fruit. My specimens are about 3 or 4 inches high.

It is the *C. ericetorum* of Pollick (*Fl. Palatin.* ii. 480. A.D. 1777) and of other authors, the *C. ciliata* of Willdenow (in *Act. Berol.* for 1794. p. 47. t. 3. fig. 2) and others. The latter name would be much more characteristic of the plant, but the dates of publication conclusively determine that Pollick's name must be adopted.

On some Species of Oaks from Northern China, collected by W. F. Daniell, Esq., M.D., F.L.S. By William Carruthers, Esq., F.L.S.

[Read June 20th, 1861.]

On returning from the late expedition to China, Dr. Daniell placed in my hands the specimens of several oaks which he had gathered on the shores of Taliewhan, a bay running into Southern Manchouria, to the west of the Corea, and chiefly in a small valley about a mile from the sea, where they grew mixed with *Pinus densiflora*, Sieb., *Salix Babylonica*, L., &c. The specimens belong to six species, three of which are new and undescribed. Two of these species, however, want flowers and fruit, and although remarkable in the shape and characters of their leaves, and different from anything hitherto noticed, I have not ventured to name and describe them from the foliage only. I have added a fourth species which I found among the plants, now in the Herbarium of the British Museum, brought home by Sir George Staunton from Northern China.

All of them, in which the fruit is known, belong to Blume's section of the genus characterized by the acorn cup having imbricated scales, and named by Endlicher *Lepidobalanus*. They are

1. Q. obovata, *Bge.*
2. Q. Mongolica, *Fisch.*
3. Q. McCormickii, n. sp.
4. Q. serrata, *Thunb.*
5. Q.—sp.?
6. Q.—sp.?
7. Q. acuminatissima, n. sp.

1. Quercus obovata, *Bge. Mem. St. Petersb.* vol. ii. p. 136.
Hab. From Taliewhan, *Dr. Daniell*; and between Pekin and Jehol, *Sir George Staunton.*

2. QUERCUS MONGOLICA, *Fisch*; *Ledebour Flora Rossica,* vol. iii. p. 589. Foliis petiolatis vel subsessilibus obovatis, basi auriculata sinuato-lobata, a medio ad basin cuneato-attenuatis sinuato-lobatis, lobis sursum versis subacutis muticis a medio utrinque decrescentibus, sinubus acutis, subtus glaucis glabris; cupula squamis adpressis gibbosis sericeis muricata, squamis superioribus parvis cupulam non excedentibus; nuce ovata cupulam duplo excedente styli basi apiculata.
Hab. From Taliewhan, *Dr. Daniell*; and between Pekin and Jehol, *Sir George Staunton.*

From the fine specimens given me by Dr. Daniell I have slightly amended the character of this species: this was the more needed to separate it clearly from the following.

3. QUERCUS MCCORMICKII. Foliis breviter petiolatis obovatis, basi lobata, a medio ad basin cuneato-attenuatis sinuato-lobatis, lobis sursum versis rotundato-obtusis muticis a medio utrinque decrescentibus, sinubus acutioribus, subtus glaucis, glabris vel rarius subtus ad venas pilis raris obsitis; cupulæ squamis externis triangulatis sericeis, internis membranaceis lineari-lanceolatis margine et apice ciliatis cupulam valde excedentibus; nuce rotundata cupulæ squamas vix excedente styli basi apiculata.
Hab. From Taliewhan, *Dr. Daniell.*

The difference between the foliage of this species and the preceding is so trifling, that, but for the fruit, it would be difficult to separate them. The shape of the acorn, and especially the scales of the cup, however, supply obvious and striking peculiarities. Instead of the compact scales of *Q. Mongolica,* Fisch., the cup is nearer that of *Q. obovata,* Bge.; but the scales are more compact, shorter, and more erect.

4. Quercus serrata, *Thunb. Flor. Jap.* p. 176.
Hab. From Taliewhan, *Dr. Daniell.*

5. Quercus, sp.
Hab. From Taliewhan, *Dr. Daniell.*

This is a shrub, growing to the height of 6–10 feet. It appears to be nearly related to *Q. serrata,* Thunb., both having the leaves glabrous above and glaucous below, from a compact covering of small white hairs, and having also the veins running out into setæ; but the uniform obovate shape of the leaves, and the almost entire absence of the petiole (scarcely exceeding a line in length, as opposed to an inch in *Q. serrata*, Thunb.) strikingly separate it from that species.

6. Quercus, sp.

Hab. Taliewhan, *Dr. Daniell.*

This is also a dwarf oak, from 6 to 10 feet high. It differs from *Q. Chinensis*, Bge., which seems to be its nearest ally, in wanting the glaucous or canescent covering on the under surface of the leaf (both sides being equally glabrous, and nearly of the same colour), and in the remarkable panduriform shape of the nearly sessile leaf. The petiole is 1–2 lines long.

7. QUERCUS ACUTISSIMA. Foliis petiolatis, e basi rotundata vel obtusiuscula ovato-lanceolatis acutissimis serratis, serraturis setaceo-excurrentibus, venis et setis sursum spectantibus glabris; fructibus breviter pedunculatis; cupulæ squamis sericeis, externis parvis, internis elongatis subulatis cupulam excedentibus.

Hab. Chinese province of Kiangsi, *Sir George Staunton.*

The form of the leaf separates this species from the last, and the glabrous under-surface as well as the remarkable difference in the fruit separate it from *Q. serrata*, Thunb., under which name specimens of it have been distributed by Dr. Asa Gray. The veins and the setæ are directed more upwards than in the allied species. The petiole is 5–8 lines long.

On the identification of the Grasses of Linnæus's Herbarium, now in possession of the Linnean Society of London. By Colonel WILLIAM MUNRO, 39th Regt., C.B., Chevalier of the Legion of Honour, F.L.S., &c.

[Read April 4th, 1861.]

I BEG to offer to the Linnean Society, as the envied possessors of the original authenticated collections of Linnæus himself, the accompanying notes on the identification of the various grasses contained in his Herbarium.

Hoping that ere very long I shall be able to offer to botanists a full account of all grasses at present known in collections, I have devoted considerable time to the identification of the species of the earliest authors, with the view of clearing up some of the numerous mistakes in synonymy, which add so very much to the labours of any systematic botanist who wishes to treat any natural order in a really scientific spirit. Amongst grasses I find the errors extraordinarily numerous. Many of these might have been avoided by consulting herbaria easily accessible; and very many might have been avoided by a little care, and less anxiety for the creation of species. With many, a difference in locality seems to have been quite sufficient reason for giving a different specific name. This idea was not consequent on following in Linnæus's steps. In the comparatively few mistakes he has made, he has erred in the contrary direction, and placed in one species two or three very different plants. In another respect Linnæus's example might have been well followed. He had great regard to the priority of names; and although he was the first to apply specific ones, he has frequently, as his MSS. show, altered his own, because he found previous terms, that would answer for specific and generic names, had been used by Gronovius, Scheuchzer, and others. Linnæus appears to have paid great attention to the Gramineæ. The specimens are in remarkably good condition, and in only two instances are they insufficient for absolute identification.

The numbers in the Herbarium refer to those used in the first edition of the 'Species Plantarum,' Linnæus's own copy being very carefully marked by himself. In the following list I have used these numbers, *underlining* them, as was done by Linnæus himself, thus 1, 2, &c., to imply that the plant was actually in the Herbarium. When Linnæus's name remains unaltered in the best authors of the present day, I have marked the plant with ! after the name, as, 1. *Lygeum Spartum*, L.! I have carefully examined every grass in the Herbarium; and in annexing the following list of names which I consider they should bear, I trust the list may be of some little use to botanists who are unable to consult the Herbarium itself. I have inserted all the names contained in the following works by Linnæus:—first, all in the 1st edition of the 'Species Plantarum,' published 1753; then all extra in the 2nd edition, published in 1762; then all in the two Parts of the 'Mantissa' (as far as p. 143 published in 1767, and from that to the end in 1771), which Linnæus styles a supplement to the 6th edition of the 'Genera Plantarum' and to the 2nd edition of the 'Species Plantarum.' I have also included all published in a paper entitled "A First and Second Century of Plants collected in various parts of the world, by Kalm, Osbeck, Loefling and others," in the 4th volume of the 'Amœnitates Academicæ' (1759), and, further, all grasses contained in a paper on the plants of Jamaica sent by Browne, in the 5th volume of 'Am. Acad.' (1760). These, with the exception of about half-a-dozen described in the 'Systema Naturæ,' also included in this list, appear to me to comprise all the grasses for the nomenclature of which Linnæus is personally responsible.

I have also occasionally added a few notes on some of the grasses of the younger Linnæus, which are in the Herbarium.

Stoke Bishop, near Bristol,
February 18th, 1861.

CINNA, *Sp. Pl.* 1st edit. p. 5.

1. *Cinna arundinacea*, L.! The specimen is from the Upsal Garden, raised from seeds sent by Kalm from North America, where the plant is common. In the same envelope, without number or locality, is a specimen of *Hymenachne Myurus*, P. de B.

ANTHOXANTHUM, *l. c.* p. 28.

1. *A. adnatum*, L. The well-known vernal grass. The only species, in the Herbarium, of the genus.
2. *A. Indicum* is stated to be No. 25 Fl. Zeyl., which is in Hermann's Herb. vol. v. fol. 29, and is *Perotis latifolia*, Ait., very fairly figured by Plukenet, t. 119. f. 1.
3. *A. paniculatum*, described by Linn. as having 4-flowered spikes. I am unable to decide positively what this is; but Kunth is probably correct when he states it is a synonym of *Festuca spadicea*, Gouan.

NARDUS, *l. c.* p. 53.

1. *N. stricta*, L.!
2. *N. Gangitis* is *Lepturus incurvatus*, Trin. The specimen collected at Montpellier. Much confusion has been occasioned by the drawings erroneously quoted by Linnæus. Lobel, Icon. 84 is one of leaves only, and is, I believe, *Andropogon laniger*, Desf.; Morison, t. 13. f. 8 is *Ctenium Americanum*; hence Kunth quotes *N. Gangitis*, Linn., as a synonym of that plant. Why the name *Gangitis* was given to a plant collected in the South of France, it is difficult to explain, except from some confusion regarding Lobel's plant, which is one of those believed to produce the Nard of the ancients. The specimen is to be found amongst *Festuca*, q. v.
3. *N. ciliaris* is *Ischæmum leersioides*, Munro in Seemann's Herb.
4. *N. articulatus*. There is no specimen of this; and it is omitted in the 2nd edition.

N. aristatus, 2nd edit. p. 78, from Rome, is *Psilurus nardoides*, Trin.

N. Indica, Linn. Herb., is *Microchloa setacea*, R. Br.

N. Thomæ, Linn. Herb., is *Oropetium Thomæum*, Trin.

LYGEUM, *Sp. Pl.* 2nd edit. p. 78.

1. *L. spartum*, L.!

CORNUCOPIÆ, *Sp. Pl.* 1st edit. p. 54.

1. *C. cucullatum*, L.!

C. alopecuroides, Mant. p. 28 (1767), is *Alopecurus utriculatus*, Pers.

SACCHARUM, *l. c.* p. 54.

1. *Saccharum officinarum*. The specimen marked by Linnæus himself is not the true Sugar-cane, but is *Erianthus Japonicus*, P. de B. It is also wrongly marked in pencil, "*Sacch. polystachyum*, Sw.?" which is *Panicum ferrugineum*, Kunth. The reference to Sloane, Jam. p. 108, t. 66, is correct, that being a very fair drawing of the true Sugar-cane.

2. *S. spicatum* is *Imperata arundinacea*, Cyrill. One specimen is from C. B. S., and another has been named by Smith *Perotis latifolia*, β, Willd., i. 324, where, however, the confusion is very great, two or three different plants being confounded together.

S. spontaneum, L.! Mant. p. 183, from Koenig.

S. Ravennæ, Linn. Herb., is *Erianthus Ravennæ*.

PHALARIS, *l. c.* p. 54.

1. *P. Canariensis*, L.!

2. *P. phleoides* is *Phleum Boehmeri*, Wib.

3. *P. arundinacea*, L.!

4. *P. erucæformis* is *Beckmannia erucæformis*, Host.

5. *P. oryzoides*. One, from Gronovius, is *Leersia oryzoides*, Sw.; another specimen, from Browne, is *Leersia hexandra*, Sw.

The following also in Herbarium :—

P. bulbosa, Amœn. Acad. iv. 264; 2nd edit. Sp. Pl. p. 79, is *Phleum tenue*, Schrad.

P. aquatica! Am. Ac. *l. c.*

P. zizanioides, Mant. 183, is *Andropogon muricatus*, Retz.

P. tuberosa, Mant. 557, is marked by Smith as *P. nodosa*, Syst. Veg., and is the plant now so called.

P. paradoxa, Linn. Herb., from Upsal Garden, is the plant so called now. In MS. notes to 1st edit. it is called by Linn. *P. utriculosa*, with a marginal note "*P. paradoxa*, 1665."

PASPALUM

is not a genus of the 1st edit., but appears in the 2nd, p. 81; and the following species are in the Herbarium :—

P. dissectum, L.! From North America, *Kalm*. This was published in 1st edit. Sp. Pl. p. 57, as *Panicum dissectum*. Pinned to this is a specimen of *Paspalum conjugatum*, Berg.

P. virgatum, L.! From Browne, well figured by Sloane, t. 69. fig. 2.

P. paniculatum, L.! Another specimen, pinned to this, and also marked *paniculatum*, is *Paspalum fluitans*, Kunth.

P. distichum! Amœn. Acad. v. 391, from Jamaica, *Browne*.

P. scrobiculatam, L.! Mant. 29. Raised in the Upsal Garden, from seeds received from India.

A plant marked by Linn. "*Paspalum*," and by Smith "*pubescens*, Br. Prod. i. 188?" is *Paspalum granulare*, Trin.

In the same envelope, merely marked C. B. S., is a specimen of *Eustachys petræa*, Desv.

PANICUM, *Sp. Pl.* 1st edit. p. 55.

1. *P. alopecuroideum* is *Gymnothrix Thouarii*, P. de B. Received by Linnæus from China. The reference to Plukenet, t. 119. f. 1, is incorrect, as that is *Perotis latifolia*, Ait. The reference in 2nd edit. f. 82, to Pluk. t. 92. f. 5, is probably correct.

2. *P. polystachyum*. The specimen is *Pennisetum barbatum*, Schult. Another, from the Upsal Garden, is *Setaria glauca*, P. de B., stated to have been raised from American seeds. Another is *Setaria viridis*, P. de B., and another, also marked 2, and pinned to the others, is *S. verticillata*, P. de B.

3. *P. Americanum*. There is no specimen in Herb.; and the plant is omitted in the 2nd edition.

4. *P. Italicum* is *Setaria Italica*, Kunth. Another specimen, from Upsal Garden, is named *P. Germanicum* by Linnæus.

5. *P. Crus Galli*, L.! A small state, from Kalm.

6. *P. dissectum*. Already referred to as *Paspalum dissectum*.

7. *P. dimidiatum* is *Stenotaphrum Americanum*, Schrank. The specimen from India.

8. *P.* (*Digitaria*) *sanguinale*! L.

9. *P. filiforme*, from Kalm, is *Paspalum filiforme*, Sw. This contains also a piece of *Muhlenbergia diffusa*, Willd. Another sheet, from Upsal Garden, contains *P. sanguinale*, L.

10. *P. compositum*. The plant was originally described from Fl. Zeyl. 42, and is what is now called *Oplismenus compositus*; but the specimen in the Herbarium is *Oplismenus Burmanni*.

11. *P. dichotomum*, L.! From Kalm, and is the plant described by A. Gray as *dichotomum*.

12. *P. clandestinum*, L.! From Kalm also, a form of *P. latifolium*, L. Linnæus's reference to Sloane, t. 80, is erroneous, as that is a species of *Manisuris*.

13. *P. capillare*, L.! From the Upsal Garden.

14. *P. patens*, L.!

15. *P. dactylon* is *Cynodon dactylon*, Pers.

16. *P. miliaceum*, L.!

17. *P. latifolium*, L.! From Kalm, North America. A specimen attached to this from Carolina is *P. divaricatum*, L., to which Sloane's figure, t. 71. f. 3, belongs; another, marked *latifolium*, is *P. oryzoides*, Sw.

18. *P. brevifolium*, L.! Allied to *P. patens*. The specimen was from India; but the reference to Plukenet, t. 189, f. 4, is erroneous, that being *Isachne australis*.

19. *P. arborescens* is *P. notatum*, Retz. Obs. iv. 18, and is very different from the *arborescens* of Fl. Zeyl. 43, of which there is a specimen in Hermann's Herb., and is probably *P. patens*. On the same sheet in Linnæus's Herb. are some portions of a species of *Arundinaria*, which may have been the origin of *arborescens*.

20. *P. virgatum*, L.! From Gronovius.

P. verticillatum, 2nd edit. p. 82, is *Setaria verticillata*: vide No. 2, ante.

P. glaucum, *l. c.* 83, is *S. glauca*, P. de B.

P. viride, *l. c.* 83, is *S. viridis*, P. de B.

P. hirtellum, Am. Acad. v. 391, from Jamaica, is *Oplismenus Burmanni*, P. de B.

P. Crus Corvi, L.! 2nd edit. p. 84. From a garden.

P. colonum, L.! 2nd edit. p. 84, also marked *P. brizoides*. One from Browne is true *colonum*; another, marked *colonum*, is *Echinochloa Crus Galli*.

P. lineare, *l. c.* p. 85.

P. grossarium, L.! Am. Acad. v. 392. This plant is often called *P. pubescens*.

P. divaricatum, L.! Am. Acad. v. 392. From Jamaica. This plant has often been confounded with *P. latifolium*, and bears the names of *P. ruscifolium*, *maculatum*, *glutinosum*, and *agglutinans*. Another specimen of *divaricatum* is marked *arborescens* by Smith.

P. repens, L.! 2nd edit. Sp. Pl. p. 87. This is *P. arenarium*, Brotero.

P. brizoides, Mant. 184, is *P. colonum*. See above.

P. conglomeratum, Mant. 324, is, I suppose, the same as *P. Indicum*; there is, however, no specimen so marked.

P. distachyon, L.! Mant. 183. Closely allied to *P. Petiverii*, Trin., with only two spikes.

P. ramosum, L.! Mant. 29, from the Upsal Garden. A common species in India, closely allied to *P. grossarium*.

P. coloratum, L.! Mant. 30, from Upsal Garden. This approaches *P. virgatum* very closely, and is unlike any uncultivated plant I have seen. Smith quotes Jacquin, Icon. Rar. i. t. 12.

P. curvatum, L.! Syst. Nat. xii. 732, is a loosely flowered state of what is usually called *P. interruptum*, Willd. The specimen is marked by Smith as "*Holcus striatus*."

P. Indicum, L.! Herb. Linn., Mant. 184, from Koenig. This is also marked *Panicum Johannæ*. A very small simple state.

P. incurvum, Linn. Herb., is a hairy-glumed state of the preceding, also marked by Smith as *Holcus striatus*.

P. musciparum, Linn. Herb., which I cannot find described anywhere, is *P. miliare*, Lam.

P. oryzoides, Herb. Linn., marked "Ard. Spec. 2, t. 5," is *Echinochloa stagnina*, P. de B.

No. 516, placed in *Panicum*, is *Sporobolus Indicus*, R. Br.; and

No. 513, also so placed, is *Eragrostis brizoides*, N. ab E.

PHLEUM, *Sp. Pl.* 1st edit. p. 59.

1. *P. pratense*, L.!
2. *P. alpinum*, L.!
3. *P. arenarium*, L.!
4. *P. schœnoides* is *Crypsis schœnoides*, Lam.

P. nodosum, Sp. Pl. 2nd edit. p. 88, is only a form of *P. pratense*.

ALOPECURUS, *l. c.* p. 60.

1. *A. pratensis*, L.!
2. *A. geniculatus*, L.!
3. *A. hordeiformis* is *Gymnothrix cenchroides*, R. et Sch.
4. *A. Monspeliensis* is *Polypogon Monspeliensis*, Desf.

A. agrestis, L.! 2nd edit. p. 89.

A. paniceus, 2nd edit. p. 90, is called *Cynosurus paniceus* in 1st edit., and is *Polypogon maritimus*, Willd.

Alopecuroides, so marked in Linn. Herb., is *Gymnothrix Thouarii,* P. de B.; and another so called is *Penicillaria spicata,* Willd., marked by Smith as "*Alopecurus indicus,* Syst. Veg., sent by Afzelius as *Holcus spicatus mas.*"

MILIUM, *Sp. Pl.* 1st edit. p. 61.

1. *M. effusum,* L.!

2. *M. confertum* is *Piptatherum.*

M. paradoxum, 2nd edit. p. 90, called *Agrostis paradoxa* in 1st edit., is *Piptatherum paradoxum,* P. de B.; and one pinned to it, from Carniola, is *Piptatherum virescens* of Trin.

M. lendigerum, 2nd edit. p. 91, is *Gastridium australe,* P. de B.

M. punctatum, Am. Acad. v. 392, from Jamaica, Browne, is *Helopus pilosus,* Trin.

M. capense, Mant. 185, is *Danthonia* (*Pentaschistis*) *papillosa,* N. ab E., or an allied species.

AGROSTIS, *l. c.* p. 61.

1. *A. Spica Venti* is *Apera Spica Venti,* P. de B.

2. *A. miliacea,* from Upsal Garden, is *Piptatherum multiflorum,* P. de B., as also is another, marked *A. sepium.*

3. *A. arundinacea* is *Deyeuxia sylvatica.*

4. *A. rubra.* Not in Herb.

5. *A. canina,* L.! Smith has marked one specimen of this "*capillaris,* Huds. nec Linn.; *Agrostis vulgaris,* Fl. Brit.; *tenuis,* Sibth."

6. *A. paradoxa* is *Milium paradoxum,* referred to above.

7. *A. stolonifera.* The Herbarium contains one of the forms of *A. vulgaris,* which is called *stolonifera,* the Fiorin Grass; another, marked *stolonifera* by Linn., is *A. verticillata,* Vill.

8. *A. capillaris,* L.!

9. *A. alba,* L.! An unawned state; and pinned to it is a specimen of *A. canina.*

10. *A. minima* is *Mibora verna,* Adans.

11. *A. Virginica* is *Vilfa Virginica,* P. de B.; and pinned to it is a specimen from Kalm of *Sporobolus heterolepis,* A. Gray.

12. *A. Indica,* from Browne, is *Sporobolus Indicus,* R. Br.; and pinned to it is a specimen of *Polypogon Monspeliensis,* Desf., also marked by Linn. "*Indica* 12." The reference to Pluk. t. 191. f. 5, is erroneous, as that is *Heteropogon contortus.*

A. Calamagrostis, Sp. Pl. 2nd edit. p. 92. Not in Herb.

A. interrupta, Sp. Pl. 2nd ed. p. 92. Not in Herb.

A. radiata, Am. Acad. v. 392, from Browne, is *Chloris radiata*, Sw.

A. cruciata, Sp. Pl. 2nd ed. p. 94, from Browne, is *Chloris cruciata*, Sw.

A. bromoides, Mant. 30, is *Aristella bromoides*, Bertol.

A. australis, Mant. 30, is *Gastridium australe*, P. de B.

A. serotina, *l. c.* 30, is *Diplachne serotina*, Link.

A. Matrella, *l. c.* 185, is *Zoysia pungens*, Willd.

A. pumila, L.! *l. c.* 31, I think a good species, although included by Kunth and others in *A. vulgaris*. It is about 3 inches high.

A. Mexicana, *l. c.* 31, from Upsal Garden, is *Muhlenbergia Mexicana*, Trin.

A. Cornucopiæ, Linn. Herb., from Kalm, is the plant properly so called now, and which has been subdivided into *A. laxiflora*, *A. scabra*, *A. Michauxii*, &c. The naming is not in Linnæus's handwriting.

A. tenacissima, Linn. Herb., is *Muhlenbergia sobolifera*, Trin.

A. maritima, Linn. Herb., from Klein, is *Vilfa pungens*, P. de B., also *Phalaris disticha*, Forsk.

A. aurea, Hall, 1498, is *Agrostis setacea*, Curtis.

A. No. 20 is *Hymenachne Myurus*, P. de B.

A. without a specific name is *Leptochloa virgata*, P. de B.

The same envelope contains a species of *Chusquea* from Browne, a specimen of *Poa nemoralis*, of *Deyeuxia neglecta*, and *Festuca sylvatica*, none named.

Aira, *Sp. Pl.* 1st edit. p. 63.

1. *A. spicata*. In the 2nd edition this name is altered to *A. Indica*. It is *Panicum Indicum*, L. The specimen is marked by Linn. "*Panicum*," and a reference is made to Mant. 184, where the plant is described as *Panicum Indicum*. *A. spicata* of 2nd edition, p. 95, is *Trisetum subspicatum*, P. de B.
2. *A. cristata*. Not in Herb. Probably *Kœleria aristata*. See No. 12, below.
3. *A. cœrulea* is *Molinia cœrulea*, Mœnch.
4. *A. arundinacea*. Not in Herb.
5. *A. minuta*. A small state of *Airopsis agrostidea*, Cand.
6. *A. aquatica* is *Catabrosa aquatica*, P. de B.
7. *A. subspicatum* is *Trisetum subspicatum*, P. de B.
8. *A. cæspitosa* is *Deschampsia cæspitosa*, P. de B. A viviparous speci-

men from Lapland is marked by Smith as "*lævigata* fide Don;" a species of *Poa nemoralis* is pinned to it.

9. *A. flexuosa* is *Deschampsia flexuosa.*

10. *A. montana.* Part is *Agrostis rupestris*, All.; part is *Poa flexuosa*, Wahl.; and another, marked "from China, Osbeck," is *Eriachne Hookeri*, Munro in Hb. Hooker., from Assam and Tenasserim.

11. *A. alpina* is *Deschampsia alpina.*

12. *A. canescens* is *Corynephorus canescens*, P. de B.; and pinned to it are two specimens of *Kœleria cristata*, which probably belong to No. 2.

13. *A. præcox*, L.!

14. *A. caryophyllea*, L.! Pinned to it is a specimen of *Poa annua.*

A. capensis, Linn. Herb., is *Ehrharta calycina*, Sm. The same envelope contains a specimen of *Sporobolus Indicus*, and a *Brizopyrum* from C. B. S.

MELICA, *Sp. Pl.* 1st edit. p. 66.

1. *M. ciliata*, L.!

2. *M. nutans*, L.!

3. *M. altissima*, L.!

M. papilionacea, L.! Mant. 31. From Brazil, *Arduin.* Linnæus also called this, in MS., *M. spectabilis.*

M. minuta, L.! Mant. 32.

M. Falx, Linn. fil. Supp. 109, is *Harpechloa capensis*, Kunth.

M. cynosuroides, Linn. Herb., is *Enteropogon melicoides*, Nees.

POA, *l. c.* p. 67.

1. *P. aquatica* is *Glyceria aquatica*, Sm.

2. *P. alpina*, L.! Two specimens, one of which is from Lapland, are true *P. alpina*; and there are two of *P. trivialis.* Linn. in MSS. says *alpina* may be a form of *trivialis.*

β. vivipara. Of this there are three sheets, all *P. alpina*, except part of one, which is *Festuca ovina* viviparous.

3. *P. trivialis*, L.!

4. *P. angustifolia.* One specimen is *P. pratensis*, var. *angustifolia*; and another, pinned to it, is *P. nemoralis*; another is *P. annua.*

5. *P. pratensis*, so marked by Linn. fil., is *P. alpina.*

6. *P. annua*, L.!

7. *P. flava,* marked Gron. Virg. 13, is *Poa crocata,* Michx.; but that name should be altered to *P. flava.*

8. *P. pilosa.* Not in Herb.

9. *P. amabilis,* L.! This is the plant which is generally called *P.* (*Eragrostis*) *plumosa,* Link. It is also Hermann's species (fide Herb. ii. 59 !) from which *Fl. Zeyl.* 46 is described, and is Pluk. t. 300. f. 2, marked in the margin, by Linnæus himself, *P. amabilis,* and to be found in Plukenet's Herb. i. 187, from Cape Comorin. The plant generally called *P. amabilis* is *P.* (*Erag.*) *unioloides,* and is also to be found in Plukenet's Herb. *l. c.*

10. *P. Eragrostis,* L.!

11. *P. capillaris,* L.! One from Kalm; another from Sloane, figured at t. 72; and another from Upsal Garden: all true *P.* (*Erag.*) *capillaris.*

12. *P. Malabarica* is *Panicum Arnottianum,* Nees. The reference to Rheede is correct; it is a very fair drawing.

13. *P. Chinensis,* sent by Osbeck from China, is *Leptochloa Chinensis,* Nees.

14. *P. tenella.* There is much confusion about this plant. There is no specimen in the Herb. of what is now considered *tenella.* One from India marked *tenella* by Linn. is the same as No. 9, above, *P. amabilis*; and Linnæus has written a long MS. description on the specimen. Rumph. Amb. 6, t. 4. f. 3, is a good drawing, and is marked by Linnæus himself as *Poa tenella.* Rheede, if correctly quoted, is a miserable drawing. Pluk. t. 300. f. 2 is *P. amabilis.* I therefore consider that all above belong to *P. amabilis,* and that the *P. tenella* ultimately intended by Linnæus is what is now called *Eragrostis tenuissima,* Schrad., is Pluk. t. 190. f. 4, and is in his Herb. i. 186 !

15. *P. compressa,* from Upsal Garden, is ordinary *Poa pratensis.*

16. *P. nemoralis,* L.! Seven sheets are correct; one, also so marked, from Kalm, is *Reboulea gracilis,* Kunth; *Reboulea truncata,* Torr.

17. *P. bulbosa,* L.! All viviparous except one specimen with very narrow leaves and extremely similar to *P. ligulata,* Boiss.

P. palustris, 2nd edit. Sp. Pl. p. 98. Not in Herb.

P. rigida, Am. Acad. iv. 265, is *Festuca rigida,* Kunth.

P. ciliaris, L.! Am. Acad. v. 392. From Jamaica, *Browne.*

P. spicata, Mant. 32. Not in Herb.

P. distans, Mant. 32, is *Sclerochloa arenaria,* Nees. This is marked by Linnæus "*Aira aquatica.*"

A plant marked *Poa* by Linn., and *Aira cristata*, No. 14, by some other person, is *Kœleria cristata*, Pers.

"*Poa juncea*, &c., Hall. Hist. 1459," is *Festuca spadicea*, Gouan. The same envelope also contains a specimen of *Poa arctica* and *Eragrostis bifaria*, Vahl, both unnamed.

BRIZA, *Sp. Pl.* 1st edit. p. 70.

1. *B. minor*, L.!
2. *B. media*, L.!
3. *B. maxima*, L.!
4. *B. Eragrostis*. One specimen from Kalm, and one marked "Morison, Hist. 204, t. 6. f. 52," are both *Poa Eragrostis*, L.! One marked C. B. S. 384, is *Eragrostis Chapellieri*, Kunth.

B. virens, 2nd edit. p. 103, is merely a form of *B. media*. One specimen is marked by Linnæus "*B. anceps*."

UNIOLA, *l. c.* p. 71.

1. *U. paniculata*, L.! Pluk. t. 32. f. 6 is a good drawing.
2. *U. spicata*, L.! One from Kalm is *Poa Michauxii*, Kunth; another, from Siberia, Pallas, is *Æluropus brevifolius*, Trin.

U. bipinnata, 2nd edit. p. 104, is *Poa* (*Eragrostis*) *cynosuroides*, Retz.

U. mucronata, *l. c.*, is not in the Herbarium.

DACTYLIS, *l. c.* p. 71.

1. *D. cynosuroides* is *Spartina cynosuroides*, Willd.
2. *D. glomerata*, L.!

D. ciliaris, Mant. 185, from C. B. S., is *Lasiochloa ciliaris*, Kunth.

D. lagopoides, Mant. 33, is *Æluropus lævis*, Trin.

Another, marked, but not by Linn., "*Dactylis paleacea*, 296," is *Kœleria cristata*, Pers.

CYNOSURUS, *l. c.* p. 72.

1. *C. cristatus*, L.!
2. *C. echinatus*, L.!
3. *C. Lima* is *Wangenheimia disticha*, Mœnch.
4. *C. durus* is *Sclerochloa dura*, P. de B.
5. *C. cæruleus*. One specimen is *Sesleria cærulea*, Arduin; the other is *S. sphærocephala*, Arduin.

6. *C. Ægyptiacus* is *Dactyloctenium Ægyptiacum,* Willd. There are one erect and one procumbent form of the same from Jamaica (Browne).

7. *C. Indicus* is *Eleusine Indica,* Gærtn. One specimen, sent from Browne.

8. *C. paniceus* is *Polypogon Monspeliensis,* Desf., omitted in 2nd edition.

9. *C. aureus* is *Lamarckia aurea,* Mœnch.

C. virgatus, Am. Acad. v. 393, from Jamaica (Browne), is *Leptochloa virgata,* P. de B.

C. Coracanus, Sp. Pl. 2nd ed. p. 106, is *Eleusine Coracana,* Gærtn.

C. Uniolæ, Linn. fil. Supp., is *Brizopyrum unioloides,* Nees; and this contains a small scrap of *Cynodon Dactylon,* Pers.

FESTUCA, *Sp. Pl.* 1st edit. p. 73.

1. *F. ovina,* L.! Correct, except one from Kalm, which is *F. tenella,* Willd. Another in the Herbarium, marked *F. varia,* Hall. 1439, is also *ovina.*

2. *F. duriuscula,* L.!

3. *F. rubra,* L. has very hairy spiculæ. Linn. in a MS. note says it is a variety of *duriuscula.* One pinned to it is marked by Linn. *F. dumetorum,* and is certainly only *rubra.*

4. *F. amethystina.* Not in Herb.

5. *F. Myurus,* L.! A very small dwarf state.

6. *F. maritima.* Not in Herb.

7. *F. bromoides,* L.! In my opinion, the same as No. 5.

8. *F. decumbens* is *Triodia decumbens,* P. de B.

9. *F. elatior,* L.! Another sheet of this is marked "*F. palustris,* No. 26."

10. *F. fluitans* is *Glyceria fluitans,* Br.

11. *F. cristata,* also marked by Linn. "*Poa cristata,*" is *Kœleria phleoides,* Pers., also marked by Linn., on the back of the sheet, "*Alopecurus Monspeliensis.*"

F. reptatrix, 2nd edit. Sp. Pl. p. 108, from Egypt, is *Diplachne fusca,* P. de B.

F. fusca, l. c. 109, is the same plant.

F. calycina, l. c. 110, is *Schismus marginatus,* P. de B. This is also marked "12. *F. barbata.*"

F. decumbens, l. c. 110. Not in Herb.

F. serotina, l. c. 111. Not in Herb.

F. dumetorum, l. c. 109. Already mentioned under No. 3.

F. spadicea, L.! Syst. Nat. 732.

F. phœnicoides, Mant. 32. Not in Herb.

There is also a specimen of *F.* [*Vulpia*) *ciliata* not marked by Linn.; also one of *Sclerochloa arenaria*; another, marked "*F.* Hall. Hist. 1445," is *Kœleria cristata*; another, unnamed, is *Festuca borealis,* Mert. & Koch.

F. spinosa, Linn. fil. Supp. 111, is *Eragrostis spinosa,* Pers.

In this envelope, but why placed here I know not, is part of a plant marked "*Nardus spuria Gangitis,* Lobel." It is the lower portion of the culm of *Andropogon laniger,* Desf., known in commerce as *Schœnanthus,* &c.

Bromus, *Sp. Pl.* 1st edit. p. 76.

1. *B. secalinus,* L.! Pinned to it a specimen of *B. mollis,* marked "*B. hordeaceus,* No. 32."
2. *B. squarrosus,* L.!
3. *B. purgans,* from Upsal Garden, is the same as No. 4.
4. *B. ciliatus,* L.! From Kalm, and his seeds raised in Upsal Garden. One marked *B. ciliatus* by Smith is *B. rubens.*
5. *B. sterilis,* L.!
6. *B. arvensis,* L.! marked by Smith "Cav. Ic. 590."
7. *B. tectorum,* L.!
8. *B. hordeaceus.* Omitted in 2nd edition, and referred to *B. mollis,* which it is.
9. *B. giganteus,* from Arduin, is *Festuca gigantea,* Vill.
10. *B. pinnatus* is *Brachypodium pinnatum,* P. de B.
11. *B. cristatus* is *Triticum cristatum,* Schreb. In the MS. notes of 2nd edition it is transferred to *Triticum.*

B. mollis, L.! 2nd edit. p. 112. One small specimen is marked "*B. nanus,* Weigel."

B. Madritensis, L.! Am. Acad. iv. 265. From Upsal Garden; another specimen, marked "No. 35 *Bromus erectus,* R. Syn.," is also this.

B. rubens, L.! Am. Acad. iv. 265. From Spain.

B. scoparius, L.! Am. Acad. *l. c.* The true plant from Spain; another marked *scoparius* is *B. Japonicus.*

B. racemosus, L.! 2nd edit. Sp. Pl. p. 114. Linnæus has marked one specimen *B. secalinus*.

B. triflorus, *l. c.* p. 115. Not in Herb.

B. distachyos, Am. Acad. iv. 304, is *Trachynia distachya*, Link. One specimen is marked by Linn. as his *Secale bromoides*; and another, pinned to it, No. 36, from England, is *Brachypodium sylvaticum*.

B. inermis! Mant. 186, is in Herb.; but no specimen is so marked by Linnæus.

B. ramosus. There is much confusion, again, about this plant. The plant described in Mant. 34, sent from the East, and marked "Allioni, 2233, from Scheuchzer," is *Brachypodium ramosum*, R. et Schultes, the term *ramosus* being applicable to the stem. The only plant marked *ramosus* by Linn. is *Bromus asper* of Murray, sent by Schreber.

B. geniculatus, Mant. 33, is *Festuca* (*Vulpia*) *geniculata*, Willd.

B. rigens, Mant. 33, is a hairy-glumed state of *B. scoparius*, L.

B. stipoides, Mant. 557, is *F.* (*Vulpia*) *geniculata*, Willd.

There is also a specimen of *B. erectus*, Huds., marked "*B. agrestis*, Allioni." A specimen of *Brachypodium sylvaticum* is marked "*Bromus gracilis*, Weigel."

Stipa, *Sp. Pl.* 1st edit. p. 78.

1. *S. pennata*, L.!

2. *S. juncea*, L.! One is correct, and one specimen is *S. sparta*, Trin., with much smaller flowers.

3. *S. avenacea*, L.! "Virg. Gron. 133." This is also marked "No. 3. *capillata*."

S. capillata, L.! 2nd edit. p. 116. There is a specimen not named.

S. tenacissima, Am. Acad. iv. 266, is *Macrochloa tenacissima*, Kunth.

S. membranacea, 2nd edit. p. 116, is *Festuca* (*Vulpia*) *uniglumis*, Solander.

S. arguens, *l. c.* p. 117, is *Anthistiria ciliata*, Linn. fil.

S. Aristella, Syst. Nat. iii. 229, is *Aristella bromoides*, Bertol.

S. Spinifex, Mant. 34, is *Spinifex squarrosus*, Linn. fil.

S. spicata, Thunb. 378, is *Heteropogon hirtus*, Pers.

There is also a specimen of *Lasiagrostis Calamagrostis*, Link, without a name.

Avena, *l. c.* p. 79.

1. *A. Sibirica*, from Gmelin, is *Stipa Sibirica*, Lam.

2. *A. elatior* is *Arrhenatherum avenaceum,* P. de B.

3. *A. Pennsylvanica,* from Kalm, is *Trisetum palustre* of Trinius and American authors.

4. *A. Lœflingiana,* from Spain, is *Trisetum Lœflingianum,* P. de B.

5. *A. sativa,* L.! One specimen is marked by Linn. *A. ponderosa.*

6. *A. fatua,* L.! One sheet marked 6 is *A. barbata,* Brot.

7. *A. flavescens* is *Trisetum flavescens,* P. de B. Pinned to it a specimen of *A. pratensis.*

8. *A. fragilis* is *Gaudinia fragilis,* P. de B.

9. *A. pratensis,* L.! Some specimens are also marked "*spicata,*" which they are not.

10. *A. spicata,* from Kalm, is *Danthonia spicata,* N. et Sch., also marked "*bromoides.*"

A. nuda, Am. Acad. iii. 401, is an unnamed state of *A. sativa.*

A. sterilis, L.! 2nd edit. Sp. Pl. p. 118, is probably only a form of *A. fatua.* One pinned to it, also marked *A. sterilis,* is *Macrochloa arenaria,* Kunth.

A. sesquitertia, Mant. 33. No specimen in Herb.

A. pubescens, L.! 2nd edit. Sp.Pl. 1665, is only a form of *A. pratensis,* as Linnæus in a MS. note suggests: he has also marked it "*Avena* near *sesquitertia.*"

A. stipiformis, Mant. 34. Not in Herb.

A. patula, Hall. Hist. 1489, from Dick, is a small state of *A. pratensis.*

A. bromoides, Sp. Pl. 1666, is *A. pratensis,* L.

A. hispida, Thunb., is *Tristachya leucothrix,* N. ab E.

There are four species of *Danthonia* from C. B. S. without names, but probably sent by Thunberg. The same envelope contains a specimen of *Andropogon Schœnanthus,* a scrap of *Diectomis fastigiata,* and of *Bromus squarrosus.*

LAGURUS, *Sp. Pl.* 1st edit. p. 81.

1. *L. ovatus,* L.!

L. cylindricus, 2nd ed. p. 120, is the large European form of *Imperata arundinacea,* Cyrill.

ARUNDO, *l. c.* p. 81.

1. *A. Bambos* is *Bambusa arundinacea,* Willd. The leaves attached are small, and the stipules spinous.

2. *A. Donax*, L.! Both specimens are marked "Kl.," which, I suppose, indicates Klein. One is real *A. Donax*; the other is *Phragmites communis*, Trin.

3. *A. Phragmites*, from Browne and from Ind. or., are *Phragmites communis*, Trin. A much expanded state is marked "*Phrag. arundinacea*, Allam. Ep. ad Linn. 1770."

4. *A. epigejos*. The first marked by Linn. "*epigejos*" is *Phragmites*. Pinned to it are specimens of *Deyeuxia montana*, Poir., one marked on the back "*A. montana*, Fl. Suec.;" and one is *Calamagrostis lanceolata*, Roth.

5. *A. Calamagrostis* is *Calamagrostis epigejos*, Roth. Awn basal, with hairs longer than the flower. Another marked "*A. Calamagrostis*" is *Lasiagrostis Calamagrostis*, Link.

6. *A. arenaria* is *Ammophila arundinacea*, Host.

ARISTIDA, *Sp. Pl.* 1st ed. p. 82.

1. *A. Adscensionis*, L.! Linn. remarks that this is one out of four plants which constitute the flora of the Island of Ascension, the others being *Sherardia fruticosa*, *Euphorbia origanoides*, and *Portulaca*.

A. Americana, L.! Am. Acad. v. 393. From Jamaica, Browne. This is called *A. dispersa* by Trin.; but Linnæus's name ought to take precedence. Kunth has misplaced the Linnean synonym in *Eutriana juncifolia*.

A. plumosa, L.! 2nd edit. Sp. Pl. p. 1666, from Armenia, is *Aris.* (*Stipagrostis*) *plumosa*.

A. arundinacea, Mant. p. 186, from Koenig, is *Arundo Madagascariensis*, Kunth.

There is a specimen of *Aristida Hystrix*, from Thunb., and another, marked No. 47, var. β, is *A. vestita*, Thunb.

LOLIUM, *Sp. Pl.* 1st ed. p. 83.

1. *L. perenne*, L.!

2. *L. temulentum*, L.!

L. tenue, 2nd ed. Sp. Pl. 122, is merely a form of *L. perenne*.

L. distachyon, Mant. p. 186, from Koenig, is *Digitaria ciliaris*, Pers.

ELYMUS, *Sp. Pl.* 1st ed. p. 83.

Linnæus has not attached his usual mark to the five following as being in his Herbarium; but they are all present:—

1. *E. arenarius*, L.!

2. *E. Sibiricus*, L.!

3. *E. Canadensis*, L.!

4. *E. Virginicus*, L.!

5. *E. Caput Medusæ*, L.!

E. Philadelphicus, Am. Acad. iv. 266, from Canada, is the same as No 3 (*E. Canadensis*).

E. Hystrix, L.! Sp. Pl. 2nd ed. p. 124. From Gronovius.

E. caninus, Fl. Suec., 2nd ed. Sp. Pl. p. 124. Two specimens marked "B and 37," from England, are *Triticum caninum*, Schrad. One marked "*Gmelin* 23" is *Trit. repens*; another marked "*Gm.* 25" is *Elymus Sibiricus*.

E. Europæus, L.! Mant. 35.

SECALE, *Sp. Pl.* 1st ed. p. 84.

1. *S. cereale*, L.!

2. *S. villosum*. Not in Herb.

3. *S. orientale*. Not in Herb.

4. *S. creticum*. One was originally so marked by Linn., but was scratched through. It is *Triticum villosum*, P. de B.

HORDEUM, *Sp. Pl.* 1st ed. p. 84.

1. *H. vulgare*, L.!

2. *H. hexastichon*. Not in Herb.

3. *H. distichon*. Not in Herb.

4. *H. Zeocriton*, L.! Awn of the central spicula 4–5 inches.

5. *H. murinum*, L.! Intermediate glumes sometimes fringed.

6. *H. jubatum*, L.! From Kalm.

H. bulbosum, Am. Acad. iv. 304. Has a very remarkable bulbous stem; but I believe it to be only a variety of *H. murinum*.

H. nodosum, 2nd edit. Sp. Pl. p. 126, is certainly *H. pratense*, Huds., of which there are also two other specimens without any name, and the species does not seem to have been taken up by Linnæus.

A plant marked 101 is *Secale cereale*, L.

TRITICUM, *Sp. Pl.* 1st ed. p. 85.

1. *T. æstivum*. Not in Herb.

2. *T. hybernum*. Not in Herb.

3. *T. turgidum*, L.! is ordinarily cultivated wheat, included in *T. vulgare*, Vill.

4. *T. Spelta*, L.! The specimen of this is marked 4, and is *Spelta*, but it is also marked by Linn. "*T. hybernum.*"

5. *T. monococcum*, L.!

6. *T. repens*, L.!

7. *T. caninum*, L.! A small specimen is present, but not marked. In the 2nd edition the plant is removed to *Elymus*.

T. Polonicum, L.! 2nd edition, p. 127.

T. tenellum, *l. c.* 127, is *Brachypodium Poa*, R. et Sch., with three nerves to the glumes.

T. junceum, L.! Am. Acad. iv. 266.

T. maritimum, 2nd edit. p. 128, is *Sclerochloa dichotoma*, Link. Another marked "*Poa maritima*" by Linn., "*T. loliaçum*" by Sm., and "*Festuca maritima*, No. 69," is *Brachypodium Poa*.

T. unilaterale, Mant. 35. This is also marked "*Nardurus* 6" by Linn. and by Smith "*T. subulatum*" and "*T. Hispanicum.*" I believe them all to be forms of *T. tenellum* mentioned above.

T. prostratum, Linn. fil. Supp. 114, from Pallas, is also in the Herbarium.

ORYZA, *Sp. Pl.* 1st ed. p. 333.

1. *O. sativa*, L.!

ZEA, *Sp. Pl.* 1st ed. p. 971.

1. *Zea Mays*, L.! One male specimen and one female of the peculiar form called *Macleatum*; glumes much elongated.

COIX, *Sp. Pl.* 1st ed. p. 972.

1. *C. Lachryma Jobi*, L.!

TRIPSACUM. Not in 1st edit.; in 2nd edit., p. 1378.

T. dactyloides, L.! From the Upsal Garden.

OLYRA. Not in 1st edit.; in 2nd edit., p. 1379, from Am. Acad. v. 408.

O. latifolia, Linn.

ZIZANIA, *Sp. Pl.* 1st edit. p. 991.

1. *Z. aquatica*, L.! The plant so named is the small state which I believe Linnæus, in his Mant. p. 295, intended to indicate by *palustris*,

of which form there is also a specimen from Upsal Garden, marked "*palustris*" by Sm. *Z. aquatica* would then be Sloane's plant 110, t. 67; and the large species what is called "*Tuscanina*" in North America, of which there is a good specimen in the Herbarium marked, but not by Linn., *Z. effusa*.

2. *Z. palustris* is taken up from Rheede; but there is no specimen in the Herbarium.

SPINIFEX, *Sp. Pl.* Not in 1st or 2nd edit.: first described in Mantissa, p. 300.

S. squamosus, L.! male and female specimens.

PHARUS. Not in 1st edit.; 2nd edit., p. 1408.

P. latifolius, L.! Am. Acad. v. 409. From Jamaica.

ANDROPOGON, *Sp. Pl.* 1st edit. p. 1045.

1. *A contortum*, described from India. Not in Herb.
2. *A. divaricatum*, L.! from Virginia, Gron. 135, is *Androp. ternatus*, Nees, which name must give precedence to Linnæus's.
3. *A. nutans*, L.! From Jamaica, and also Virginia, Kalm, marked "*Lagurus*, Clayton, 600."
4. *A. alopecuroides*, from North America, is *Erianthus saccharoides*, Mich.
5. *A. distachyon* is *Apocopis Wightii*, Nees ab Esenb. Smith has written "Ask Thunberg if this be Burser's plant?" I suppose this has misled others, and hence a very different plant from Linnæus's original specimen is now called *Androp. distachyus*.
6. *A. Schœnanthus*, L.! From India and Arabia. This is the plant generally called "*A. Martini*," Roxb., "*A. pachnodes*," Trin., and many other names. It is quite distinct from Wallich's *A. Schœnanthus*. Linnæus's specimen is remarkably well figured by Ventenat, Cels. t. 89.
7. *A. Virginicum*, L.! From America.
8. *A. bicorne*, L.! From Brazil and Jamaica.
9. *A. hirtum*, L.! From Sicily, Smyrna, and Lusitania.
10. *A. Nardus*, L.! Described in Fl. Zey. 45, as *Lagurus*, and the plant there described is to be found in Hermann's Herb. vol. ii. 66.
11. *A. Ischæmum* is not the plant generally considered *A. Ischæmum*, but is *Andropogon provincialis*, Lam., a plant that I have rarely seen.

12. *A. fasciculatum.* Contains two species. One is *Eleusine Indica,* Gærtn., and the other is *Pollinia ciliata,* Trin. The reference to Sloane, t. 69, p. 2, is incorrect, as that is *Paspalum fasciculatum.*

A. caricosum, L.! 2nd edit. Sp. Pl. p. 1480, is *Androp. serratus,* Retz, which name must give place to Linnæus's.

A. Gryllus, Am. Acad. iv. 332, from South Europe, is *Chrysopogon Gryllus,* Trin.

A. insulare, l. c. v. 412, is *Panicum leucophæum,* H.B.K.

A. Ravennæ, 2nd edit. p. 1481, is *Erianthus Ravennæ,* P. de B.

A. muticum, l. c. 1482, described from C. B. S., is not in Herb.

A. polydactylon, Am. Acad. v. 412, from Jamaica, is *Chloris polydactyla,* Sw.

A. quadrivalvis, Mant. 303, printed in the margin, by mistake, "*nutans,*" is *Anthistiria ciliata,* Retz.

A. cymbarium, L.! Mant. 303, is the beautiful species of *Cymbopogon* which Sprengel calls *C. elegans.* Sent by Koenig from Ind. or.

A. prostratum, Mant. 304, is *Anthistiria prostrata,* Willd.

A. barbatum, Mant. 302, described from India, is *Chloris barbata,* Sw.

A. scabrum, Linn. Herb.! from Koenig, is *Chamæraphis hordeacea,* R. Br.

A plant from Feuillée, is *Androp. Xanthoblepharis,* Trin. Icon.; and there is also another of *Schisachyrium brevifolium* from the same person.

HOLCUS, *Sp. Pl.* 1st edit. p. 1047.

1. *H. Sorghum* is *Sorghum vulgare,* Pers.

2. *H. saccharatus* is not in Herb.

3. *H. halepensis,* from Upsal Garden, is *Sorghum halepense,* Pers., awned and unawned.

4. *H. lanatus,* L.!

5. *H. odoratus.* One specimen is *Hierochloë borealis,* R. et Sch.; the other is *Hier. australis.*

6. *H. laxus,* from Virginia, is *Uniola gracilis,* Michx.

7. *H. striatus,* Gron. Virg. 135, is *Panicum gibbum,* Elliot.

H. spicatus, Sp. Pl ed. 2. p. 1483, is *Penicillaria spicata,* Willd. This is also marked "*Alopecurus Indicus*" by Sm.

H. mollis, L.! 2nd edit. p. 1485.

H. latifolius, l. c. 1486, from Asia, Osbeck, is *Centotheca lappacea,* Desv. This is also marked "*Cenchrus lappaceus* and *Bambu Ramp.*"

H. bicolor, Mant. 301, from Persia, is a form of *Sorghum vulgare.* Pers.

H. pertusus, Mant. 301, is *Andropogon pertusus,* Willd.

H. serratus, Linn. Herb., is *Panicum serratum,* R. Br.

APLUDA, *Sp. Pl.* 1st edit. p. 82.

There is much confusion about this genus. The species which appears in 1st edition is first described in 2nd edition Gen. Pl. (1742) as No. 1018, *Ischæmum,* from Scheuchz., and this is the plant described in 5th edition of Gen. Pl. (1754). The plant described in the 6th edition is *Zeugites* in the 8th edition, Schreber's (1789): it is the first *Apluda*; and hence I suppose P. de B. has called ordinary *Apluda, Calamina.*

1. *A. mutica,* L.!

A. aristata, L.! Am. Acad. iv. 303. This is also to be found in Herb. Pluk. i. 188. On one page there is a plant of *Anthistiria prostrata,* Willd.

A. Zeugites, Am. Acad. (1759) v. 412, figured by Browne as *Zeugites* (in 1755), is *Zeugites Americana,* Willd.

A. digitata, Linn. fil. Supp. 434, is *Polytoca bracteata.* Bennett in Pl. Jav. rar.

MANISURIS. Not in 1st or 2nd edit. *Sp. Pl.* Just appears in Mantissa, 300.

M. Myurus, L.! Marked by Koenig "*Ægilops sanguinea,*" and by Linnæus as "*Ischæmum Myurus.*" Is sometimes called *Peltophorus Myurus,* Nees.

ISCHÆMUM, *Sp. Pl.* 1st edit. p. 1049.

1. *I. muticum,* L.!
2. *I. aristatum,* L.! is what is generally called *I. barbatum.* One specimen is *Spodiopogon obliquivalvis,* Nees.

There is one spicula of *I. rugosum,* marked "*Cicadaria,*" from Koenig; and by Smith, "*Ischæmum rugosum,* Salisbury Ic. t. 1."

Ischæmum murinum from Forst., not in Linnæus's handwriting, is *Spodiopogon aureus,* Hook. et Arn. in Bot. of Beechey's Voyage.

There is also a single specimen of *Erianthus aureus,* P. de B., without name or locality; and a plant marked "*Isch. aculeatum,*" which is *Ceytosis aculeata,* Willd.

Cenchrus, 1st edit. *Sp. Pl.* p. 1049.

1. *C. racemosus* is *Lappago racemosa*, Willd.
2. *C. capitatus* is *Echinaria capitata*, Desf.
3. *C. echinatus*, L.! with rather a long spike.
4. *C. tribuloides*, L.! Sent by Kalm from Virginia.
5. *C. frutescens*. Not in Herb.

C. lappaceus, 2nd edit. p. 1488, is not in Herb., and the word is erased by Linnæus in a MS. note.

C. muricatus, Mant. 302. from Koenig, is *Trachys mucronata*, Pers. This is also named "*C. tripsaceus*" and "*Tripsacum distachyon*."

C. ciliaris, Mant. 302. One from Upsal Garden, and one from C. B. S.; are both *Pennisetum cenchroides*, Richd.

C. granularis, Mant. 575, is *Manisuris granularis*, Sw.

Ægilops, *Sp. Pl.* 1st edit. p. 1050.

1. *Æ. ovata*, L.!
2. *Æ. caudata*, L.!
3. *Æ. squarrosa*. Not in Herb.
4. *Æ. triuncialis*, L.!
5. *Æ. incurvata* is *Lepturus incurvatus*, Trin.

Æ. exaltata, Mant. 575, from Koenig, is *Ophiurus corymbosus*, Gærtn.

Rottbœllia is a genus of Linn. fil., first published in 'Nova Graminum Genera' (1779). The Herbarium contains

R. incurvata, which is *Lepturus incurvatus*;

R. compressa, Linn. fil. Suppl. 114, which is *Hæmarthria compressa*, R. Br.;

R. dimidiata, Linn. fil. Suppl. 114, which is *Stenotaphrum Americanum*, Schrank;

R. exaltata, Linn. fil.! *l. c.* 114.; and

R. corymbosa, Linn. fil. *l. c.* 114, which is *Ophiurus corymbosus*, Gærtn.

Notes on *Caryophylleæ*, *Portulaceæ*, and some allied Orders.

By George Bentham, Esq., Pres. L.S.

[Read June 6, 1861.]

The series of orders in which natural affinities are the most dissevered by the Candollean arrangement is undoubtedly that of the Curvembryonous group, of which each one appears to be connected with the others by gradations so close that positive limits have very seldom been assigned to any of them, and yet they are necessarily dispersed in the three great classes of Thalamifloræ, Calycifloræ, and Monochlamydæ. Thus we find in the 'Prodromus' that the numerous genera constituting the group are distributed among ten orders:—Caryophylleæ, referred to Thalamifloræ; Paronychiaceæ, Portulaceæ, and Ficoideæ, to Calycifloræ; and Phytolaccaceæ, Salsolaceæ (Chenopodieæ), Basellaceæ, Amarantaceæ, Polygonaceæ and Nyctagineæ, to Monochlamydæ. In this arrangement De Candolle appears to have been sometimes guided by the characters shown in what had been considered as the *typical* genus of each order. But the so-called typical genus of an order, as I believe I have already had occasion to point out to the Society, has not been always the one exemplifying in the most striking degree the characters prevailing in the majority of its co-ordinates, but, on the contrary, has often been remarkably exceptional, having been selected to give its name to the order from being the earliest or the most familiarly known to European botanists. Thus in Portulaceæ, for instance, the supposed typical genus *Portulaca*, having a semi-inferior ovary, determined the position of the order among Calycifloræ. It is, however, in that respect a remarkable exception in the order, all the rest of which (as it is usually limited) is essentially hypogynous. Some Caryophylleous genera are also more perigynous than several of those included by De Candolle in the supposed perigynous order Paronychiaceæ.

To remedy these and similar incongruities, several transpositions have been suggested by those who adhere generally to the Candollean classes. Thus, Asa Gray reduces Paronychiaceæ to a suborder of Caryophylleæ, and removes also Portulaceæ next to them among Thalamifloræ. Harvey and Sonder bring Phytolaccaceæ also up to Thalamifloræ, but leave Portulaceæ and Ficoideæ in Calycifloræ. Lindley rejecting the distinction between Apetalæ and Polypetalæ, has two hypogynous alliances—*Silenales*, consisting of Caryophyllaceæ, Illecebraceæ, Portulaceæ and Polygonaceæ, and *Chenopodales*, consisting of Nyctaginaceæ, Phytolaccaceæ, Amarantaceæ and Chenopodiaceæ; and one perigynous alliance, *Ficoidales*, composed of Basellaceæ, Mesembryaceæ, Tetragoniaceæ and Scleranthaceæ. Endlicher, on the other hand, rejecting the character derived from staminal insertion, but maintaining that founded on the presence or absence of petals, places Mesembryaceæ, Portulaceæ, Caryophyllaceæ and Phytolaccaceæ in one cohors among his Dialypetalæ, and Chenopodiaceæ, Amarantaceæ, Polygoneæ and Nyctaginaceæ in another cohors far away among Apetalæ. All, however, are ready to suggest that in a really natural system all the above orders ought to be brought together, which cannot be done without entirely rejecting the above-mentioned great Candollean classes; yet no substitute has been proposed for these classes, except a vain endeavour so to modify the linear series as to bring allied orders into close approximation. Thus Grisebach, one of the most able advocates for this arrangement (which, with any one for whose views we had less respect, we should be tempted to call a disarrangement), brings indeed all our Curvembryonous orders together, but places them between Euphorbiaceæ and Malvaceæ, which in our view have quite as much right to be placed in close proximity as Caryophylleæ and Chenopodieæ *.

In considering how to deal with these various proposals, we must observe that none of the classes, groups, or alliances so formed are limited by any character that does not undergo many exceptions among the genera placed under them; nor are we able to devise any other that shall be thus strictly and absolutely defined. Even the curvature of the embryo round a farinaceous albumen, the chief character of the whole group, can scarcely be traced in *Dianthus*, in some *Polycarpææ*, in *Anacampseros* and its allies, in some *Polygoneæ*, &c.; and the position of the leaves, the presence or absence of stipules and petals, the number and insertion of the stamens, the relative position of sepals, petals, stamens and carpels, the degree of combination or reduction of the carpels and ovules, are characters so variously combined or dissevered, as always to leave small anomalous genera invalidating or uniting any groups we can form. Our object has therefore been to seek out such limitations as may bring together genera having the greatest general resemblance, and united by such tangible characters as should have the fewest exceptions.

Our first great group is that of the CARYOPHYLLEÆ, the normal characters of which (besides those common to all the above orders) are opposite leaves; sepals, petals, and one or usually two series of stamens, all isomerous; a free one-celled ovary with several ovules in the centre, and formed by the combination of two or more carpels; and a dehiscent or several-seeded fruit. The opposition of the leaves has no exception; the sepals are never reduced, nor the petals increased in number, although the latter are often very much reduced in size, and in a few species totally deficient; the stamens of either series are never increased in number, but occasionally irregularly reduced, or one or the other series deficient; the ovary, if ever divided into cells, is only so at the very base or at a very early stage; the carpels are always closely combined, and in some genera the styles also; both are often reduced in number below that of the other parts of the flower, but never increased, and never reduced to one simple one; and there is only one species where the ovules are reduced to a single one. In the great majority of species the petals and stamens are hypogynous, and if, in a few others, the disk which bears them is perigynous, it is only slightly so; and we therefore concur with other botanists in placing the order among Thalamifloræ. We estimate the total number of good species of Caryophylleæ at about 800, and we distribute them into three tribes: 1. SILENEÆ, with a gamosepalous calyx and free styles; in these the stamens are always hypogynous, and there are no stipules; 2. ALSINEÆ, with free sepals and free styles; in them the stamens are hypogynous or slightly perigynous, and scarious stipules are present only in about half-a-dozen species (*Spergula* and *Spergularia*); and 3. POLYCARPÆÆ, with free sepals and combined styles. The stamens are, as in Alsineæ, hypogynous or slightly perigynous, and the stipules are most frequently, or perhaps always, present.

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* When in this and other similar papers I make use of the plural *we*, with reference to any general views on the principles of distribution and limitation of genera, I refer to those of Dr. Hooker and myself as adopted for the 'Genera Plantarum' we are preparing.

Our next order is that of the PORTULACEÆ, which, with the ovary of Caryophylleæ, is at once distinguished by the remarkable anisomery of the parts of the flower. The sepals are usually 2 only, with petals varying from 3 to 7 or 8; in one species only (*Lewisia*) the sepals are 5 or 6, with 8 to 10 petals. In no case are the petals deficient. The stamens are most frequently more numerous than the petals, and where equal to them in number, or fewer (sometimes only one), they are always opposite to them and adhering to their base. It was this remarkable divergence from the ordinary arrangement of the stamina in the group of orders we are considering, that induced Fenzl to extend the Portulaceæ so as to include all genera where a tendency to a similar arrangement may have been traced or supposed. But whilst we do full justice to the accuracy of Dr. Fenzl's observations on the whole of the curvembryonous orders which he has investigated with so much detail, we cannot concur in the general views he has taken of their delimitation, which, indeed, have not met with general adoption. The disturbance of the ordinary alternation in the different whorls composing the flower is curious in several Caryophylleæ, without our being able to detect any cause or to trace any connexion with other characters: thus the styles are opposite the sepals in *Cerastium*, alternate with them in *Sagina*, and when exceptionally pentagynous, as in *S. aquatica*, in *Stellaria*. The stamens, when reduced to 5, are usually opposite the sepals, but alternate with them in *Colobanthus*, without however being epipetalous or accompanied by any other of the characters of Portulaceæ; and, again, in *Schiedea*, so nearly allied in most respects to *Stellaria*, and having both series of stamens present in their usual position, the petals are opposite the sepals, which does not occur in any other genus of the Curvembryonous group. It has been endeavoured to explain this circumstance by calling the petals staminodia or sterile filaments; but that does not remove the difficulty; for when staminodia do exist in any allied order, they are not, any more than petals, placed as in *Schiedea*.

The Portulaceæ, as we should continue to limit them, have been generally recognized as a natural group. They are more or less succulent. The leaves are alternate or occasionally opposite, but never perhaps so strictly so as in Caryophylleæ; the petals either very fugacious or shrinking very soon into a withered mass, which makes it very difficult in some of the minute-flowered species to ascertain their number or shape from dried specimens. All genera, except *Portulaca* itself, are essentially hypogynous; and in *Portulaca*, where the ovary is half-inferior, the ring bearing the petals and stamens is as closely connected with the ovary as with the calyx; so that if, as has been suggested, the adherent base of the flower be considered as an enlarged concave torus or summit of the pedicel, the insertion of the petals in *Portulaca* may be said to be less truly perigynous than in those Alsineæ where they proceed from a disk lining the base of the calyx and free from the ovary. We therefore have no hesitation in following A. Gray and others, who rank Portulaceæ among Thalamifloræ. The ovary in *Portulacaria* is uniovulate, and becomes an indehiscent 3-winged nest; and in *Silvæa* the fruit is a 1-seeded utricle; but in both genera the flowers are too decidedly Portulaceous to remove them from the family.

The Tetragonieæ and Sesuvieæ, united by Fenzl with Portulaceæ, differ both from them and from Caryophylleæ in their ovary divided into cells, and in their very perigynous stamens.

We would propose to restore them to FICOIDEÆ, where they were placed by De Candolle and others, and from which they chiefly differ in the absence of petals. As they belong most decidedly to Calyciforæ, which we have not as yet worked up in detail, I shall defer for the present any further observations on the genera they consist of.

The MOLLUGINEÆ, also included by Fenzl among Portulaceæ, have been referred by some to Paronychiaceæ on account of their stipules, by others to Caryophylleæ for their capsular fruit. They form a small group, however, which cannot well be attached to either of the allied larger orders without in some measure invalidating their characters. From Caryophylleæ they differ in their alternate stem-leaves (often apparently verticillate, but never really so, nor yet opposite, although the bracts may be so in a few cases), and in their septate ovary and capsule; from Portulaceæ in their isomerous calyx, septate ovary, usual want of petals, and habit; from Ficoideæ in habit and in their stamens usually hypogynous or nearly so; from Phytolaccaceæ, Paronychiaceæ, and other Monochlamydeous orders in the several-seeded cells of their ovary and fruit. They are all apetalous, except *Macarthuria*, *Telephium*, and occasionally *Glinus*, and do not well come in either with Thalamifloræ or Calycifloræ. We think they might be best placed amongst Monochlamydæ next to Phytolaccaceæ, or even incorporated in that order as a tribe, bearing in some measure a relation to the true Phytolaccaceæ similar to that which Celosieæ do to the remaining Amarantaceæ.

The PARONYCHIACEÆ form the link which unites Caryophylleæ with Amarantaceæ. They were formerly distinguished from Caryophylleæ by the supposed constantly perigynous insertion of the stamens; but this character proving in many instances fallacious, it has been proposed to take the presence of stipules as the ordinal distinction. That, again, separated *Spergula* and *Spergularia* from the closely allied Alsineæ; and Fenzl, A. Gray, and others unite the whole with Caryophylleæ. It appears to me, however, that if we limit Paronychiaceæ to the genera with a uniovulate (although compound) ovary and utricular fruit, we have a distinct group, more nearly allied to Amarantaceæ than to Caryophylleæ, and which, as all except *Corrigiola* are decidedly apetalous, would take its place among Monochlamydæ.

With regard to PHYTOLACCACEÆ, characterized by the ovary consisting of one or usually several annular uniovulate carpels, and to CHENOPODIACEÆ and AMARANTACEÆ, with their vague but universally recognized ordinal distinctions, we leave them for the present as elaborately worked up in the 'Prodromus,' entering only our provisional protest against the useless change in name from Chenopodiaceæ to Salsolaceæ, against the separation of Basellaceæ as an order, against the importance attached to the erect or horizontal seeds, and against much superfluous splitting both of genera and of species upon inconstant characters.

The four orders, either retained among Thalamifloræ or now first transferred to Monochlamydæ, call however for some observations as to the limits of genera which I shall now severally enumerate.

I. CARYOPHYLLEÆ.

The limits of most of the large genera of this order have always been very artificial, and were made to rest by Linnæus chiefly on the number of parts of the flower. As these have been shown to be in some cases very variable, and often quite unconnected with habit or other characters, A. Braun, Fenzl, and others have resorted to the embryo, the venation of the calyx, the dehiscence of the capsule, &c.; and the latter character has been especially relied upon by Fenzl, who has alone investigated specifically the whole order, and worked out a large portion of it with the greatest accuracy of detail. He has not, indeed, been always successful in the new combinations he has formed to replace the old Linnean genera; his distinction between *Arenaria* and *Alsine*, for instance, is not a natural one; but, on the other hand, he has much improved the circumscription of some genera, such as *Gypsophila*, *Cerastium*, &c., and contributed very largely to our accurate knowledge of the various forms assumed by the numerous species, races, and varieties of the order. In determining the limits to be assigned to our genera, we have always found we could place implicit reliance on the characters assigned by him to the species he examined, as well as on those given by A. Braun, J. Gay, and M. Willkomm, who have specially studied portions of the order.

Of the three above-mentioned tribes of Caryophylleæ, the first, SILENEÆ, has been universally recognized as distinctly marked out by the gamosepalous calyx, and has even been raised by many modern botanists to the rank of an independent order. We continue it as a tribe only, and we still think that the large genera of the older botanists, with some slight modifications founded on the capsule, the embryo, or on the venation of the calyx, are as natural as any that have been subsequently proposed. We purpose adopting the following eleven.

* *Semina peltata, hilo faciali. Embryo rectus.*

1. *Velezia,* Linn. 2. *Dianthus,* Linn. 3. *Tunica,* Scop.

** *Hilum marginale. Embryo periphericus.*

4. *Acanthophyllum,* C. A. Mey. 5. *Drypis,* Linn. 6. *Gypsophila,* Linn.
7. *Saponaria,* Linn. 8. *Silene,* Linn. 9. *Cucubalus,* Linn. (ex parte).
10. *Lychnis,* Linn. 11. *Wibelinia,* Hochst.

Dianthus is the most natural and best-defined genus of the whole order. The calyx is peculiar, never angular, but marked by numerous equal parallel ribs—7, 9, or 11 to each sepal, or 35, 45, or 55 in the whole, and is always surrounded at the base by one or more pairs of bracts. Ten stamens, two styles, a capsule opening at the top by 4 teeth or short valves, and seeds much flattened, attached by their inner face, with a straight embryo, complete the distinctive characters, to which we believe there are no exceptions. The species are numerous, but have been enormously multiplied in books, being particularly liable to variation in their bracts, in their showy petals, in the density of the inflorescence, &c. They are moreover said to hybridize in a wild state with the greatest facility; but this is a point which requires much further unprejudiced observation.

Tunica is a group of about 10 species which have been variously distributed in *Dianthus* and *Gypsophila,* or separated into one, two, or three genera. They have the seeds, and in most cases the bracts, of *Dianthus*; but the calyx has either only 5 nerves, as in *Gypsophila,* or at most 2 lateral ones to each sepal, or 15 in the whole. Most of the species, on account of their short calyx and small bracts, were included by Linnæus in *Gypsophila*; one species, however (now often broken up into three), with a long calyx completely enveloped in scarious bracts, was included by him in *Dianthus* (*D. prolifer*, L.), and constitutes the genus *Kohlrauschia* of Kunth. As a solitary species we think it more convenient to retain it in *Tunica,* as there are no very positive characters to separate it. Again, in Fenzl's section *Pseudotunica,* raised by Reichenbach to the rank of a genus under the name of *Fiedlera,* there are no outer bracts, but all the other characters are those of the true *Tunicas.*

Velezia, very near *Tunica* in technical characters, may nevertheless be maintained as an old-established genus, to which the very slender calyx and rigid habit give a peculiar aspect. The

Linnean character of 5 instead of 10 stamens is said not to be quite constant; but I have always found 5 only in the few specimens I have examined.

Acanthophyllum and *Drypis*, with a general affinity to *Saponaria*, are closely connected with each other in their prickly foliage, bracts and calyx-teeth, in their ovary and fruit. The ovules are few; and of these few, seldom more than one attains maturity. The capsule has been described as circumsciss, but in most cases that dehiscence has appeared to me to have arisen from the manner in which the specimens had been dried. In many Sileneæ the upper portion of the capsule assumes a more cartilaginous and stiffer consistence than the lower part; in these two genera it is particularly thick, and opens in valves only very late or not at all, whilst the lower portion, especially if gathered before it is quite ripe, remains thin and herbaceous, so as to break from it with very little force, but I have never seen the upper portion fall off naturally. The characters by which the two genera are distinguished are more artificial. *Acanthophyllum*, containing about a dozen species, has a 5-angled or 5-ribbed calyx, either without any lateral nerves, or one faint one to each sepal, on each side of the midrib; the stamens are usually 10, and the styles 2. In *Drypis*, still limited to the old Linnean species, the calyx has many ribs, with those of adjoining sepals usually free from each other as in Diantheæ, not united as in *Silene* and *Lychnis*; the stamens are usually 5, and the styles 3, although I have not unfrequently observed 2 or 5 styles. *Jordania* of Boissier appears to have the general characters of *Acanthophyllum*, without sufficient difference in habit to maintain it as a distinct genus on account of the capsule more readily splitting into 4 valves.

Gypsophila and *Saponaria*, again, are too closely blended with each other to suffer any positive line of distinction to be drawn between them, a few of the smaller-flowered species being almost equally referable to the one or to the other; yet, as old-established and rather numerous groups with a great majority of well-characterized species, they may still be maintained as separate genera. With the seeds, the 10 stamens, and other general characters of *Silene* and *Lychnis*, they are readily known by the calyx, in which the lateral nerves of adjoining sepals, if present, never amalgamate, and by the styles, which are almost if not quite always two only. They differ from each other chiefly in the calyx, which in *Gypsophila* is usually turbinate or campanulate, not contracted at the top, with 5 usually broad nerves, and is more or less membranous and veinless between them, whilst in *Saponaria* it is tubular or pyramidal or slightly contracted at the top, and, in most cases, even the midrib of each sepal is scarcely conspicuous. In *Gypsophila*, moreover, the capsule opens much more deeply into 4 valves than in *Saponaria*, which has usually only 4 short teeth.

Among the small genera proposed by various authors which we do not consider sufficiently distinct to adopt, *Banffya*, Baumg., and *Dichoglottis*, Fisch. and Mey., are chiefly distinguished by inflorescence; *Heterochroa*, Bunge (*Acosmia*, Benth. in Wall. Cat.), by the more deeply cleft calyx; and *Ankyropetalum*, Fenzl, by the rigid habit and small narrow calyx, which bring it very near to the small-flowered *Saponarias*. *Vaccaria*, Medik., a single widespread cornfield weed, appears to have been better placed by Linnæus in *Saponaria*, than by more modern botanists in *Gypsophila*.

The two large genera *Silene* and *Lychnis* are distinguished from all the preceding ones, except the single species of *Drypis*, by the styles, which are universally (except perhaps in very rare anomalous flowers) more than two, and by the calyx, which, in all but the very few conical *Silenes*, has ten more or less prominent nerves, the two lateral ones of adjoining sepals being constantly blended into one. But the limits between the two genera are less natural and less accurately defined. The Linnean character of 3 styles in *Silene*, and 5 or rarely 4 in *Lychnis*, although not quite constant, is perhaps even now the best that has been proposed, and the very few species where these numbers are slightly variable must be referred to that genus with which the great majority of their flowers agree.

With regard to their subdivision, many natural groups have been formed, which, especially in the case of *Lychnis*, have been frequently raised to the rank of genera. But the most marked are generally single species; and others, if tolerably defined in one genus, have their corresponding forms in the other, passing gradually into different groups. We therefore cannot at present see any course more in conformity to our general principle than to qualify the greater number of them as more or less artificial sections only of two artificial but large genera. I shall proceed to enumerate the most important.

Cucubalus, intended by Linnæus to include a number of *Silenes* with very inflated calyces, but since restricted to the *S. baccifer*, in which the fruit, although not exactly a berry, has the appearance of one, and does not open in valves, may still be conveniently retained as a genus; for that very decided and exceptional character is accompanied by considerable differences in the general aspect as well of the flower as of the whole plant.

Heliosperma, Reichb., proposed for a few small white-flowered *Silenes* with very muricate seeds, and *Elisanthe*, Fenzl, adopted by Willkomm for the species with laciniate petals, usually red, though both well marked in a very few cases, are too closely connected through others with the great mass of the genus to form more than sections, and even as such are not so good as *Conoimorpha*, for instance, and *Behenanthe*.

Melandrium, Roehl., has about a dozen species of *Lychnis*, chiefly northern or alpine, with inflated calyxes, and the teeth or valves of the capsule splitting into two so as to become double in number to the styles. But the calyx in some species passes gradually into that of *Lychnis* proper, and the splitting of the capsule-teeth in others is exceedingly slight, and we cannot attach much importance to it in this any more than in other Caryophylleous genera.

Viscaria, Roehl., was originally proposed for a few species in which the ovary is shortly divided at the base into 5 cells—a slight rudimentary indication of the typical formation of the gynæcium, of little more importance here than in the few *Silenes* and *Dianthuses* in which it occurs. Two of the four *Viscarias* have been again separated under the name of *Eudianthe*, as having the capsular teeth split. These formed part of *Agrostemma*, Linn., characterized by the long narrow calyx-teeth. The latter name has now been restricted to a single species only differing from *Lychnis* proper by those calyx-teeth and by the stiffness of the scales at the base of the petals; and another *Agrostemma* of Linnæus has been erected into the genus *Githago*, as having the styles alternating with, not opposite the sepals—a circumstance very difficult to ascertain with certainty in the gamosepalous genera, especially in the dried state, and which, if correct, may be due to a slight torsion of the torus.

Petrocoptis, A. Braun, comprising two Pyrenæan species, has a more definite character in the expansion of the funiculus into a small strophiola; but the habit is not very marked, and there is no other character. The æstivation of the petals is indeed said not to be contorted as in other Caryophylleæ, but it certainly is so occasionally, and a few other species of *Lychnis* have been observed where the contorted arrangement is sometimes broken. I have also myself seen it so not unfrequently in *Stellaria holostea*, and it probably occurs in other instances.

Uebelinia, Hochst., a single Abyssinian species, may, however, have sufficient claims to be admitted as a genus. Besides the reduction of the stamens to 5, the shape of the calyx, the habit, and inflorescence are very different from those of *Lychnis*, reminding one of *Gypsophila cerastioides*. The calyx has 10 ribs, and the styles are 5 as in *Lychnis*.

The numerous species of the tribe ALSINEÆ have always been found very difficult to divide into natural genera with definite characters. For those without stipules more than thirty have been proposed, of which, however, we think it most convenient to adopt the following eleven only: 1. *Holosteum*, Linn.; 2. *Cerastium*, Linn.; 3. *Stellaria*, Linn.; 4. *Brachystemma*, Don; 5. *Arenaria*, Linn.; 6. *Buffonia*, Linn.; 7. *Sagina*, Linn.; 8. *Colobanthus*, Bartl.; 9. *Thylacospermum*, Fenzl; 10. *Schiedea*, Cham. et Schlecht.; and 11. *Queria*, Linn.; and to these we add the two stipulate genera—12. *Spergula*, Linn., and 13. *Spergularia*, Pers. Of these genera the four principal ones were supposed to have been well defined by the earlier botanists—*Cerastium* by 5 styles and bifid petals, *Stellaria* by 3 styles and bifid petals, *Arenaria* by 3 styles and entire petals, *Sagina* by 4 styles and entire petals. But in each case species have been since observed where these characters have not proved constant, or where their strict adoption has occasioned severances too purely artificial to be maintained, and others have been successively called in aid.

In *Cerastium*, the form of the capsule (its elongated apex always shortly and regularly divided into twice as many teeth as styles) appears not only the best corroborative character, but even to take precedence over those derived from the divided petals and number of styles, as being more in conformity with general habit. We would thus, with Fenzl, bring into *Cerastium* the *Stellaria cerastioides*, Linn., and *S. viscida*, Bieb., although they have the 3 styles of *Stellaria*, as well as the small genus *Mœnchia*, in which the petals are entire or notched only and the flowers isomerous throughout as in *Sagina*, although the styles are opposite the sepals as in *Cerastium*. The two species referred to *Mœnchia*, the one with 4-merous, the other with 5-merous flowers, were therefore formerly placed, the first in *Sagina*, the other in *Cerastium*, but it is now generally believed that they are mere varieties of one species. Again, the *Arenaria purpurascens*, Ram., a Pyrenæan plant with much of the habit of *Cerastium trigynum* (*Stellaria cerastioides*), but with the petals and styles of *Arenaria*, and proposed as a distinct genus under the name of *Dufourea*, might, on account of the capsule, be better referred to *Cerastium*, where Fenzl once placed it.

Holosteum is a small genus, most elaborately described by J. Gay, and reducible, as he proposes, to two or even to a single species. It has the capsule of *Cerastium*, but may be maintained as distinct on account of the habit and inflorescence and the peculiar seed. This is flattened from front to back as in *Dianthus* and its allies, but the radicle, instead of being short and straight as in those genera, is turned down in a projection of the inner face by which the seed is attached, thus combining the two forms of embryo which prevail in Caryophylleæ.

Stellaria is a large and widely spread genus, tolerably natural, and, as to the large majority of species, well marked by the three styles, bifid petals, and the capsule divided to about the middle into as many entire or bifid valves. But there are a few anomalous species, mostly isolated or nearly so, which have been separated into distinct genera upon real or fancied discrepancies, which however we think ought, from the general concordance of characters, to be retained in *Stellaria*. These are—

1. *Larbrea*, A. de St. Hil., founded on *S. uliginosa*, which has the petals and stamens more distinctly perigynous than in most other species, though still very slightly so ; but this is a question of degree only, as a more or less distinct perigyny may be observed in several other species where the petals are much reduced.

2. *Malachium*, Fries, has been generally adopted for the *S. aquatica*, placed by Linnæus in *Cerastium* as having 5 styles. It differs, however, from that genus in the styles being alternate with, not opposite to, the sepals. The habit, petals, &c., are those of *Stellaria nemorum* ; the capsule only differs in the valves being rather less deeply bifid ; and the number of styles is, in Indian specimens, not unfrequently reduced to three as in other *Stellarias*.

3. *Krascheninikowia*, Turcz., was adopted by Fenzl as distinguished by the petals emarginate only or shortly bifid, although the original Siberian *K. rupestris* is apparently identical with the Carpathian *Stellaria bulbifera*, and very nearly allied to some other eastern or South-European species. The genus has, however, since been remodelled by Maximowicz and made to rest on dimorphous flowers, the apparently perfect ones in the East-Asiatic specimens being usually sterile, whilst the seeds are produced by small, almost apetalous oligandrous flowers near the base of the stem. But this, although, as far as I am aware, the first

case of dimorphism observed in the flowers of Caryophylleæ, has now been ascertained to exist in so many different Polypetalous orders, and to be so frequently not even of specific value, that we cannot admit it as a generic character when unaccompanied by any other.

4. *Leucostemma*, Benth., was a genus I originally proposed for two Himalayan species with tetramerous flowers, at a time when the number of parts was still considered as of absolute value in the generic distinction of Caryophylleæ; but Fenzl has since very properly reduced them to *Stellaria*, of which they have all the other characters.

5. *Adenonema*, Bunge, containing a few high alpine Asiatic and South-American species, differs from *Stellaria* as *Cherleria* from *Arenaria*, by its short densely tufted stems, the excessively reduced petals, and more developed glands of the disk; and the same arguments which have induced many botanists to reduce *Cherleria* to *Arenaria* (or *Alsine*) would equally apply to the reunion of *Adenonema* with *Stellaria*, especially as the passage from the one to the other is gradual.

6. *Schizotechium*, Fenzl, although only proposed as a section of *Stellaria*, might have perhaps rather more claims than any of the preceding to be adopted as a genus. It consists of two Himalayan species with a scandent habit and diffuse panicles, almost as in *Brachystemma*, and only 3 ovules, of which but one ripens. The ovary might thus be supposed to be reduced to uniovulate carpels, and to be brought technically nearer to that of Phytolaccaceæ; but there is no central axis, and a slight comparison of actual specimens will at once give the idea that it is an exceptional and irregular reduction in the ovules of a closely compound ovary, and not a normal conformity of the ovules with as many distinct or well-marked carpels. The foliage, inflorescence, and flowers are in all other respects those of *Stellaria*, in which genus we continue to retain *Schizotechium* as a section.

Brachystemma, Don, to which we have just alluded as resembling *Schizotechium* in habit, is a single Himalayan species with the entire petals of *Arenaria*. The stamens, of which 5 only bear anthers, the 2 styles, 4 ovules, and usually one-seeded capsule, may also be found occasionally in that genus; but all these features being united and accompanied by a different habit, a large scarious calyx with minute petals may warrant us in retaining it as a distinct genus.

We now come to the great genus *Arenaria*, whose limits are the most puzzling to define among the whole range of Caryophylleæ. Originally characterized by 5 sepals, 5 entire petals, 10 or rarely 5 stamens, and 3 styles, it was subsequently found that these numbers were liable to variation, that in some species the petals were excessively reduced or disappeared altogether, in others the styles were frequently reduced to 2, and that characters derived from number could no longer exclude the Linnean genera *Cherleria*, *Minuartia*, *Mœhringia*, &c., whilst on the other hand the capsule appeared to afford means of dividing the whole group in a more definite manner. Accordingly the greater number of species have been distributed into three principal genera, *Arenaria*, *Mœhringia*, and *Alsine*; and at least ten others have been proposed, chiefly for individual species in which some striking peculiarity has been observed. But a further consideration of the results has convinced us that the three large groups are far too unnatural to be considered as more than artificial sections; and that the prominent characters of the monotypic genera differ but in degree from those exemplified in other species. *Spergularia* alone forms an exception, and is generally admitted; for although the presence of stipules is its only positive character, its affinity is evidently much more with *Spergula* than with *Arenaria*.

Arenaria itself is limited by Fenzl and others to those species in which the capsular valves are more or less deeply divided so as to become double the number of the styles, and the seeds are without any strophiola; *Mœhringia* has a similar capsule, but the seeds are smooth and shining, with the funicle expanded into a strophiola; and *Alsine* has the capsular valves entire, of the same number as the styles. These characters are tolerably definite, and not liable to much variation in the same species, and therefore excellent for sectional distinction. But when it is considered that *A. Ledebouriana*, *A. Roylei*, and their allies are in *Arenaria*, whilst *A. laricifolia*, *A. pinifolia*, &c., are in *Alsine*,—that *A. pubescens*, *A. hispida*, and *A. diffusa*, Ell. (*A. nemorosa*, H. B. et K.), go together in *Arenaria*, whilst *A. trinervis*, *A. bavarica*, and *A. lateriflora* are in *Mœhringia*,—that *A. polygonoides* is in *Mœhringia* and *A. procumbens* in *Alsine* (or in *Rhodalsine* of Gay),—that *A. modesta*, *A. conimbricensis*, &c., are retained in *Arenaria*, whilst all their nearest allies belong to *Alsine*, and that the alpine cæspitose species are also distributed between the two, these sections can scarcely be considered as better genera than the old Linnean one.

The characters upon which the smaller, mostly monotypic genera *Cherleria*, *Siebera*, *Minuartia*, *Dolophragma*, *Triplateia*, *Gouf-*

feia, *Lepyrodiclis*, *Odontostemma*, *Honckeneya*, and *Merckia* have been founded are chiefly,—unisexuality, absence of petals, a great development of the glands of the disk, the division of the ovary into 3 cells, the complete separation of the capsular valves to the base, or a reduction in the number of stamens, styles, or ovules.

Unisexuality, or rather polygamy, has been much relied on for the genus *Honckeneya*, made for the *A. peploides*. But although in Europe and Asia the plant is certainly most frequently unisexual, yet in America it is generally, and according to A. Gray universally, hermaphrodite, without there being any other distinction between the two races.

The absence of petals induced Linnæus to separate *Cherleria* and *Minuartia*; but this absence has been since shown not to be constant, and other species closely allied to the one or to the other in habit have very minute petals, which again, through other species, pass into those of more conspicuous size; and accordingly Fenzl and others have already united these two genera with *Alsine*.

The glands of the disk are more or less developed in many *Arenarias*, but are only taken as generic characters as being specially prominent in *Cherleria* and in *Honckeneya*, two species which have nothing else to connect them but what is common to the whole genus *Arenaria*.

The division of the ovary into three cells is relied upon for *Dolophragma*, *Honckeneya*, and *Merckia*; and if it were constant and persistent, and only to be seen in the two latter, it might be made use of to separate them, as they have also in common a larger, almost succulent globular capsule, and some affinity in habit. But the dissepiments are only to be found at a very early stage; they are always very thin and slender, and have generally disappeared by the time the flower has expanded, and I at least have never found any remains of them when the capsule is ripe. This division into cells can therefore only be regarded as rudimentary; it may be traced here and there throughout Caryophylleæ, and, as in other cases of undeveloped rudimentary organs, no further systematic value can be attributed to it than as an indication of the normal type, of which the Caryophyllaceous ovary is a modification.

The valves of the capsule separate to the base and spread out horizontally in *Triplateia*. But the depth to which the capsule splits is very variable in the whole genus; and, in the single *Triplateia* known, there is nothing marked in habit to distinguish it from some *Mœhringias*, whilst any other exceptional characters which it possesses are also to be found in species which have not the same capsule or habit.

The stamens are reduced to 5 in *Triplateia*, in a few *Alsines*, and occasionally in other species which have little else in common with them.

The styles and, consequently, the carpels are reduced to 2, and the ovules to 4, with a depressed globular capsule, in *Gouffeia*, *Lepyrodiclis*, and *Odontostemma*, and this brings these four species (*Lepyrodiclis* having two) technically as near to *Buffonia* as to *Arenaria*; but their habit is so dissimilar from each other (except that of *Odontostemma* to one species of *Lepyrodiclis*), and that of two of them so near to that of two corresponding species of *Arenaria* proper, that they can only form a very artificial group, which we prefer to consider as a section of *Arenaria*, where a similar but less constant reduction of carpels or of ovules occurs in other very dissimilar species.

It might be said that where two or three of these exceptional characters are combined, such as the split capsule and reduced ovules and stamens in *Triplateia*, or unisexuality, large glands, and rudimentary dissepiments in *Honckeneya*, they might warrant generic separation; and so it would be if any such plant had these characters exclusively, or if they were similarly combined in several species having some general features in common; but as neither is the case in any of the above instances, we can only consider the plants so isolated as exceptional species, not as separate groups.

To the numerous small genera above enumerated as separated from *Arenaria* on insufficient grounds, we may add the following nine proposed or adopted by Reichenbach on still more trifling characters: *Sabulina*, *Tryphane*, *Facchinia*, *Alsinanthe*, *Neumayera*, *Wierzbeckia*, *Plinthine*, *Pettera*, and *Eremogone*.

With regard to *Buffonia*, it is with much hesitation that we have retained it as a small distinct genus; for the distinctive characters are very slight; and although the four (5 or 6 ?) species which compose it have much resemblance in habit, they also come very near to some of the small-flowered fine-leaved *Arenarias*.

Sagina was formerly a purely artificial genus, comprising all the tetramerous Alsineæ; but as some of these have been shown to be mere varieties of pentamerous species placed in *Cerastium* or in *Spergula*, the genus has been remodelled by Fenzl, so as to exclude *S. erecta* and to include those *Spergulas* of Linnæus which have no stipules. It has thus become much more natural, and although still very nearly allied to some of the smaller *Arenarias*, it is well characterized by the styles, whether 4 or 5, always isomerous with the sepals, and alternating with, not opposite to them as in *Cerastium*, and as in the old *Sagina* (or *Mœnchia*) *erecta*, now transferred to *Cerastium*, of which it has also the capsule. The pentamerous *Saginas* have been proposed by some German authors as a distinct genus under the name of *Spergella*; but the character is purely artificial, and not always constant in the same species.

The four remaining small genera of exstipulate Alsineæ have each some remarkable peculiarity of structure which has occasionally suggested their respective removal to some other order, but their general affinities are clearly with Alsineæ, and I have already alluded to the insufficiency of these peculiarities for their removal. Thus, *Colobanthus* has no petals, and the stamens, of the same number as the sepals, are alternate with, not opposite to them ; but the remaining characters and habit are those of *Sagina*: *Thylacospermum* only differs from the low tufted alpine Cherlerioid *Arenarias* by the calyx forming an obconical tube at the base, round the margin of which are inserted the stamens, which are thus, exceptionally, very perigynous: *Schiedea*, with the habit and most of the characters of some *Stellarias*, is distinguished by the remarkable position of the petals (or staminodia ?) opposite the petals, already alluded to : and *Queria*, very near some of the smaller annual *Arenarias*, has only one ovule and no petals, and thus passes into Paronychiaceæ ; but as the fruit is a three-valved capsule and not a utriculus, I have preferred retaining it among Alsineæ.

The stipulate Alsineæ comprise two genera of three or four species each—*Spergula*, Linn., and *Spergularia*, Pers. (*Lepigone*, Fries)—differing by their stipules only, the first from *Sagina*, the second from *Arenaria*. This character, admitted as ordinal by some botanists who transfer these genera to Paronychiaceæ, is rejected by others even as generic, as being derived from vegetative organs alone. Estimating its value from its practical relation to habit, we are induced in this instance to consider it as generic, placing *Spergula* and *Spergularia* in the tribe of Alsineæ, of which they have the free styles, rather than with the other stipulate Caryophylleæ which form our tribe of Polycarpeæ.

Balardia, Cambess., is a South-American *Spergularia* with reduced petals and stamens, and has been correctly referred to that genus by Fenzl and others.

The Caryophylleæ of our third tribe, Polycarpeæ, with free sepals and the styles more or less united, are almost all stipulate.

They comprise the eleven following genera :—1. *Drymaria*, Willd.; 2. *Polycarpon*, Linn.; 3. *Ortegia*, Linn.; 4. *Lœflingia*, Linn.; 5. *Cerdia*, Moç. et Sess.; 6. *Pycnophyllum*, Remy; 7. *Lyallia*, Hook. fil.; 8. *Microphyes*, Philippi; 9. *Stipulicida*, Rich.; 10. *Polycarpæa*, Lam.; and 11. *Sphærocoma*, Anders. Very few of these require any special observations.

Arversia, Cambess., or *Hapalosia*, W. et Arn., ought in our opinion to be reduced to *Polycarpon*. The embryo is indeed straighter in *Arversia* (*Hapalosia*) *Lœflingii* than is usual in *Polycarpon*, but it is very variable in the undoubted species of the latter genus, and I have in vain searched for the spiral twist in the valves of the capsule supposed to characterize the typical *P. tetraphyllum*.

Stichophyllum, Philippi, figured in his 'Flora of Atacames,' proves, on examination of his specimens, to be identical with one species of *Pycnophyllum*, Remy. The same plant in Meyen's collection received from Presl the manuscript name of *Xeria Meyeniana*, and is, according to Walpers, the *Arenaria bryoides*, Willd.

Lyallia, Hook. fil., is but very imperfectly known, and is only placed here from its close resemblance in habit to *Pycnophyllum*.

Cerdia, Moç. et Sess., is only known from DeCandolle's characters taken from Moçino and Sesse's drawing.

Polycarpæa, Lam. (proposed by Webb to be spelt *Polycarpia*, but perhaps without sufficient grounds for disturbing the established orthography), is now a large genus divisible into several groups, some of them distinguished by habit without characters, and others which have more definite characters have so precisely the aspect of the typical *Polycarpæas* that we cannot adopt them as separate genera. I allude especially to the two supposed Australian genera, *Aylmeria*, Mart., and *Planchonia*, J. Gay. The former closely resembles the common *P. corymbosa*, but the flowers are rather larger and more scarious, and there are 5 minute staminodia alternating with the stamens at the base of the petals. In *Planchonia*, of which we have five or six species, the flowers are often still larger and more scarious; there are no staminodia; but the petals and stamens are united, sometimes above the middle into a long tube, sometimes at the base only into a shorter cup. Yet striking as the character is in some species, it is one of degree only, and a slight union may be observed in some other non-Australian species.

Sphærocoma, T. Anders., like *Queria*, is intermediate between Caryophylleæ and Paronychiaceæ. The fruit is an indehiscent utriculus as in the latter order; but the presence of petals, and the two ovules with the funicles united in a central columella, show more affinity with Caryophylleæ.

II. Portulaceæ.

This Order, once more reduced by most botanists to its abovementioned original and natural limits, consists at present of about 125 species distributed into the following 14 genera:—1. *Portulaca*, Linn.; 2. *Portulacaria*, Jacq.; 3. *Grahamia*, Gill.; 4. *Talinopsis*, A. Gray; 5. *Anacampseros*, Linn.; 6. *Talinum*, Adans.; 7. *Calandrinia*, H. B. et K.; 8. *Claytonia*, Linn.; 9. *Spraguea*, Torr.; 10. *Monocosmia*, Fenzl; 11. *Montia*, Linn.; 12. *Silvæa*, Philippi; 13. *Calyptridium*, Nutt.; and 14. *Lewisia*, Pursh.

Of the above genera, *Portulaca*, comprising a considerable number of species, and *Portulacaria* and *Lewisia*, each of a single species, are too well marked by the exceptional characters already alluded to (p. 58) to admit of any doubt. *Grahamia* from Chili and *Talinopsis* from New Mexico, both monotypic, and *Anacampseros* from South Africa, consisting of about eight species, are closely connected by their nearly straight or slightly curved (not annular) embryo with very little albumen, and by some general resemblances in their flowers; yet, as slight differences in the calyx and bracts accompany considerable diversity in habit and a wide geographical separation, they may be maintained as distinct genera, unless the discovery of intermediate species should hereafter connect them more closely.

Talinum, *Calandrinia*, and *Claytonia* are also very closely allied to each other, being only separated by the sepals, deciduous in *Talinum*, persistent in the two others, or by the stamens, constantly 5 (one opposite each petal) in *Claytonia*, anisomerous with the petals and usually more numerous in *Talinum* and *Calandrinia*. These characters are moreover not quite constant; yet, as each group comprises a considerable number of species bearing other general resemblances to each other, we feel that it would not be safe to recommend their union into one genus without a more detailed examination of every species than can be undertaken on the present occasion.

Spraguea, a single Californian species, is nearly allied to *Claytonia*; but the remarkable calyx gives it so peculiar an aspect, that we do not venture to reduce it.

Montia, also monotypic, is, however, very distinctly characterized by its stamens (usually 3) inserted in the tube of a gamopetalous corolla.

The three remaining genera—*Silvæa*, said to consist of four species (of which I have only seen and examined one), and *Monocosmia* and *Calyptridium*, both monotypic—agree in their very small monandrous flowers; but evident differences in their inflorescence and sepals, and alleged ones in their corollas, which, on account of their extreme tenuity and rapid fading, I am unable to verify with certainty in dried specimens, have induced me to maintain them as distinct.

Baitaria, Ruiz et Pav., is one of the dwarf alpine species of *Calandrinia*, of which the bracts have been described as outer sepals. *Diazia*, Philippi, described and figured from a single very imperfect specimen, is probably also a species of *Calandrinia* with the stamens very much reduced in number. At any rate, should it hereafter prove distinct, the name must be altered, as too closely resembling *Diasia*, an Irideous genus.

Fouquiera, H. B. et K. (including *Bronnia*, H. B. et K.), connected by some authors with Portulaceæ, by others with Polemoniaceæ, is perhaps more nearly related to some of the Calycifloral groups connected with Saxifragaceæ, which we reserve for future consideration.

III. Mollugineæ.

This small group, whether considered as a tribe of Phytolaccaceæ or as an allied order, ought, in our opinion, to be limited to the following seven genera:—1. *Macarthuria*, Endl.; 2. *Telephium*, Linn.; 3. *Orygia*, Forsk. (*Axonotechium*, Fenzl); 4. ? *Glinus*, Linn.; 5. *Mollugo*, Linn.; 6. *Pharnaceum*, Linn. (*Ginginsia*, DC.; *Hyperteles*, E. Mey.); 7. *Cœlanthium*, E. Mey. In the four first genera petals are occasionally, or, in two or three species, always present; the three others, forming the great proportion of the tribe or order, are always apetalous. The total number of species is, however, not above 40.

Macarthuria was originally referred to the vicinity of Buettneriaceæ, but upon what grounds it is very difficult to imagine; the very imbricate sepals, the insertion of the stamens, the habit, &c., being so totally at variance with all the Malvoid orders. Harvey first pointed out (Kew Journ. Bot. vii. 55) its affinity with Phytolaccaceæ, and F. Müller has, I believe (although I am unable now to find a reference to his note), referred it to Mollugineæ. One species has always petals, another is quite apetalous; the ovary, styles, capsule, and seeds are quite those of Mollugineæ. The stamens appear to be always 8 in an otherwise pentamerous flower; but this want of symmetry between the number of stamens and that of the petals or sepals is very common in the whole group.

Telephium is exceptional among Mollugineæ, in that the ovary is divided into cells at the base only, but the dissepiments, short as they are, are firm and persistent; the sepals, petals, and stamens are isomerous, and the stamens are opposite the sepals, as in several Caryophylleæ; but the alternate leaves, the inflorescence, the consistence of the sepals, and other characters are those of Mollugineæ, and a very cursory comparison with *Orygia* shows a very intimate connexion of the two genera.

Orygia (a single species, dispersed over the hot dry regions of Africa and Asia) has indefinite stamens surrounded by narrow-linear petals, very variable in number or occasionally entirely wanting, and which are by some termed staminodia or barren stamens. In this respect the genus approaches *Glinus*, whilst the foliage, habit, and inflorescence are very nearly those of *Telephium*, under which genus it has sometimes been classed.

Glinus forms so gradually the passage from *Orygia* to *Mollugo*, that it is hard to assign to it precise limits; the common species has usually indefinite stamens (between 10 and 20) as in *Orygia*, but clustered axillary flowers as in several *Mollugos*, whilst the woolly indumentum and the large calyxes give it a very different aspect from the latter genus. A second species (or, according to some, a small-flowered variety only) has the reduced stamens of *Mollugo*, but the aspect of *Glinus*; and the *Mollugo spergula* of Linnæus, with the small glabrous flowers and few stamens of *Mollugo*, is considered by Fenzl as a third species of *Glinus*, of which it has the strophiolate seeds. The inflorescence is rather that of *M. verticillata* (which has no strophiola to the seeds) than of *Glinus*. This gradual connexion might suggest the propriety of considering *Glinus* altogether as a section only of *Mollugo*, which, after all, would only contain about a dozen species.

Pharnaceum is a Cape genus of about eighteen species, distinguished from *Mollugo* chiefly by fimbriate stipules and a peculiar habit. Several of the species have also a cupular hypogynous disk within the stamens, but this is not constant even in all the species considered as true *Pharnacea*. A small section, *Hyperteles*, E. Mey., retained by Harvey and Sonder as a distinct genus, has no disk and indefinite stamens; an increase, however, in the number of stamens beyond 5 occurs in some species considered as true *Pharnacea*, and the habit of the two sections is the same.

Cœlanthium, limited to two Cape species, differs from *Pharnaceum* as *Thylacospermum* from *Arenaria*, by the union of the sepals at the base into a campanulate tube, round the edge of which are inserted the stamens, being thus much more decidedly perigynous than in the rest of the group.

The genera *Psammotrophe*, Eckl. & Zeyh., and *Polpoda*, Presl, with uniovulate cells to the ovary, enumerated by Fenzl among Mollugineæ, appear to have nothing to distinguish them from true Phytolaccaceæ. *Adenogramma*, Presl, is also a Phytolaccaceous plant allied to *Giesekia*, where the ovary and fruit are reduced to a single one-seeded carpel, not compounded of 2 or 3 carpels although one-seeded as in Paronychiaceæ. *Acrossanthes*, on the other hand, both in habit and character, belongs to the apetalous Ficoideæ.

IV. PARONYCHIACEÆ.

Without having sufficiently examined all the genera of this Order to ascertain their limits with respect to each other, or the order of their arrangement, we have, however, verified the ordinal characters in all the following (except *Cardionema*):—

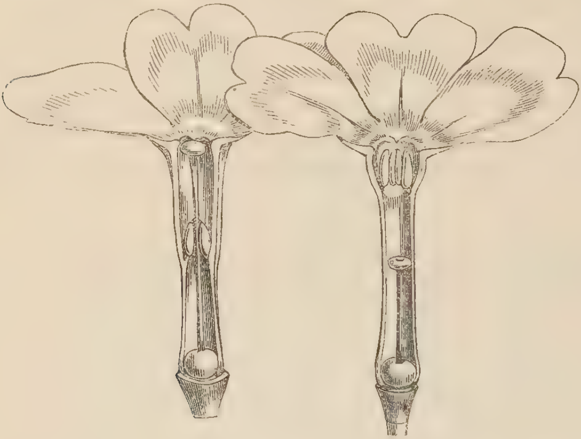
1. *Corrigiola*, Linn. (an exceptional genus in its prominent petals and alternate leaves); 2. *Herniaria*, Linn.; 3. *Illecebrum*, Linn.; 4. *Cardionema*, DC.; 5. *Pentacæna*, Bartl.; 6. *Paronychia*, Juss. (including *Siphonychia*, Torr. et Gray, and *Anychia*, Rich., and perhaps altogether, with *Cardionema* and *Pentacæna*, artificial sections of *Illecebrum*); 7. *Habrosia*, Fenzl; 8. *Sclerocephalus*, Boiss.; 9. *Gymnocarpos*, Forsk.; 10. *Pteranthus*, Forsk.; 11. *Cometes*, Burm.; 12. *Dicheranthus*, Webb; 13. *Pollichia*, Soland.; 14. *Guilleminea*, H. B. et K.; 15. *Mniarum*, Forst.; 16. *Scleranthus*, Linn.; and 17. *Lastarriea*, A. Gay.

On the Two Forms, or Dimorphic Condition, in the Species of *Primula*, and on their remarkable Sexual Relations. By CHARLES DARWIN, M.A., F.R.S., F.L.S., &c.

[Read Nov. 21, 1861.]

IF a large number of Primroses or Cowslips (*P. vulgaris* and *veris*) be gathered, they will be found to consist, in about equal numbers, of two forms, obviously differing in the length of their pistils and stamens. Florists who cultivate the Polyanthus and Auricula are well aware of this difference, and call those which display the globular stigma at the mouth of the corolla "pin-headed" or "pin-eyed," and those which display the stamens "thumb-eyed." I will designate the two forms as long-styled and short-styled. Those botanists with whom I have spoken on the subject have looked at the case as one of mere variability, which is far from the truth.

In the Cowslip, in the long-styled form, the stigma projects just above the tube of the corolla, and is externally visible ; it stands high above the anthers, which are situated halfway down the tube, and cannot be easily seen. In the short-styled form the anthers are attached at the mouth of the tube, and therefore stand high above the stigma ; for the pistil is short, not rising above halfway up the tubular corolla. The corolla itself is of a different shape in the two forms, the throat or expanded portion above the attachment of the anthers being much longer in the long-styled than in the short-styled form. Village children notice this difference, as they can best make necklaces by threading and slipping the corollas of the long-styled flowers into each other. But there are much more important differences. The stigma in the long-styled plants is globular, in the short-styled it is depressed on the summit, so that the longitudinal axis of the former is sometimes nearly double that of the latter. The shape, however, is in some degree variable ; but one difference is persistent, namely, that the stigma of the long-styled is much rougher : in some specimens carefully compared, the papillæ which render the stigmas rough were in the long-styled form from twice to thrice as long as in the short-styled. There is another and more remarkable difference, namely, in the size of the pollen-grains. I measured with the micrometer many



Long-styled. Short-styled.

specimens, dry and wet, taken from plants growing in different situations, and always found a palpable difference. The measurement is best made with grains distended with water, in which case, the usual size of the grains from short-styled flowers is seen to be $\frac{10-11}{7000}$ of an inch in diameter, and those from the long-styled about $\frac{7}{7000}$ of an inch, which is in the proportion of three to two; so that the pollen-grains from the short stamens are plainly smaller than those from the long stamens which accompany the short pistil. When examined dry, the smaller grains from the long-styled plants are seen under a low power to be more transparent than the larger grains, and apparently in a greater degree than can be accounted for by their less diameter. There is also a difference in shape, the grains from the short-styled plants being nearly spherical, those from the long-styled being oblong with the angles rounded; this difference in shape disappears when the grains are distended with water. Lastly, as we shall presently see, the short-styled plants produce more seed than the long-styled.

To sum up the differences:—The long-styled plants have a much longer pistil, with a globular and much rougher stigma, standing high above the anthers. The stamens are short; the grains of pollen smaller and oblong in shape. The upper half of the tube of the corolla is more expanded. The number of seeds produced is smaller.

The short-styled plants have a short pistil, half the length of the tube of the corolla, with a smooth depressed stigma standing beneath the anthers. The stamens are long; the grains of pollen are spherical and larger. The tube of the corolla is of the same diameter till close to its upper end. The number of seeds produced is larger.

I have examined a large number of flowers; and though the shape of the stigma and the length of the pistil vary, especially in the short-styled form, I have never seen any transitional grades between the two forms. There is never the slightest doubt under which form to class a plant. I have never seen the two forms on the same plant. I marked many Cowslips and Primroses, and found, the following year, that all retained the same character, as did some in my garden which flowered out of their proper season in the autumn. Mr. W. Wooler, of Darlington, however, informs us that he has seen the early blossoms on Polyanthuses which were not long-styled, but which later in the season produced flowers of this form. Possibly the pistils may not in these cases have become fully developed during the early spring. An excellent proof of the permanence of the two forms is seen in nursery gardens, where choice varieties of the Polyanthus are propagated by division; and I found whole beds of several varieties, each consisting exclusively of the one or the other form. The two forms exist in the wild state in about equal numbers: I collected from several different stations, taking every plant which grew on each spot, 522 umbels; 241 were long-styled, and 281 short-styled. No difference in tint or size could be perceived in the two great masses of flowers.

I examined many cultivated Cowslips (*P. veris*) or Polyanthuses, and Oxlips; and the two forms always presented the same differences, including the same relative difference in the size of the pollen-grains.

Primula Auricula presents the two forms; but amongst the improved fancy kinds the long-styled are rare, as these are less valued by florists, and seldomer distributed. There is a much greater relative inequality in the length of the pistils and stamens than in the Cowslip, the pistil in the long-styled form being nearly four times as long as in the short-styled, in which it is barely longer than the ovarium; the stigma is nearly of the same shape in both forms, but it is rougher in the long-styled, though the difference is not so great as in the two forms of the Cowslip. In the long-styled plants the stamens are very short, rising but little above the ovarium. The pollen-grains of these short stamens from the long-styled plants, when distended with water, were barely $\frac{5}{6000}$ of an inch in diameter, whereas those from the long stamens of the short-styled plants were barely $\frac{7}{6000}$, showing a relative difference of five to seven. The smaller grains of the long-styled plants were much more transparent, and before distention with water more triangular in outline than those of the other form. In one anomalous specimen with a long pistil, the stamens almost surrounded the stigma, so that they occupied the position proper to the stamens of the short-styled form; but the small size of the pollen-grains showed that these stamens had been abnormally developed in length, and that the anthers ought to have stood at the base of the corolla.

In the two forms of *Primula Sinensis*, the pistil is about twice as long in the one as in the other. The stigma of the long-styled varies much in shape, but is considerably more elongated and rougher than that of the short-styled, the latter being nearly smooth and spherical, but depressed on the summit. The shape of the throat of the corolla in the two forms differs as in the Cowslip, as does the length of the stamens. But it is remarkable that the pollen-grains of both forms, wet and dry, presented no difference in diameter; they vary somewhat in size, as do the pollen-grains of all the species, but in both forms the average diameter was rather above $\frac{10}{6000}$ of an inch. There is one remarkable difference in the two forms of this species, namely (as we shall presently more fully see), that the short-styled plants, if insects be excluded and there be no artificial fertilization, are quite sterile, whereas the long-styled produce a moderate quantity of seed. But when both forms are properly fertilized, the short-styled flowers (as with Cowslips) yield more seed than the long-styled. In a lot of seedlings which I raised, there were thirteen long-styled and seven short-styled plants.

Of *Primula ciliata* a long-styled specimen, and of *P. ciliata*, var. *purpurata*, a short-styled specimen, were sent me from Kew by Prof. Oliver. This case, however, is hardly worth giving, as the variety *purpurata* is said* to be a hybrid between this species and *P. auricula*; and the height of the stamens in the one form does not correspond with the height of the stigma in the other, as they would have done had they been the same species. There was, however, the usual difference in the roughness of the stigmas in the two forms, and the pollen-grains, distended in water, measured $\frac{6}{6000}$ and $\frac{4-5}{6000}$ of an inch in diameter. Single trusses were sent me of *P. denticulata* and *P. Piedmontana* which were long-styled, and of *P. marginata* and *nivalis* which were short-styled; and the general character of the organs leaves hardly any doubt on my mind that these species are dimorphic. In a single flower of *P. Sibirica*, however, which was sent me from Kew, the stigma reached up to the base of the anthers; so that this species is not dimorphic, or not dimorphic as far as the length of the pistil and stamens are concerned, unless indeed this single specimen was anomalous, like that mentioned of *P. auricula*.

We thus see that the existence of two forms is very general, if not universal, in the genus *Primula*. The simple fact of the pollen-grains differing in size and outline, and the stigma, in shape and roughness, in two sets of individuals of the same species, is curious. But what, it may be asked, is the meaning of these several differences? The question seems worthy of careful investigation, for, as far as I know, the use or meaning of dimorphism in plants has never been explained; hence, I will give my observations in detail, though I am far from supposing that all cases of dimorphism are alike. The first idea which naturally occurred was, that the species were tending towards a dioicous condition; that the long-styled plants, with their rougher stigmas, were more feminine in nature, and would produce more seed; that the short-styled plants, with their long stamens and larger pollen-grains, were more masculine in nature. Accordingly, in 1860, I marked some Cowslips of both forms growing in my garden, and others growing in an open field, and others in a shady wood, and gathered and weighed the seed. In each of these little lots the short-styled plants yielded, contrary to my expectation, most seed. Taking the lots together, the following is the result:—

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* Sweet's 'Flower Garden,' vol. v. tab. 123.

	No. of Plants.	No. of Umbels produced.	No. of Capsules produced.	Weight of seed in grains.
Short-styled Cowslips	9	33	199	83
Long-styled Cowslips	13	51	261	91

If we reduce these elements for comparison to similar terms, we have—

	No. of Plants.	Weight of seed in grains.	No. of Umbels.	Weight of seed.	No. of Capsules.	Weight of seed in grains.
Short-styled Cowslips	10	92	100	251	100	41
Long-styled Cowslips	10	70	100	178	100	34

So that, by all the standards of comparison, the short-styled are the most fertile; if we take the number of umbels (which is the fairest standard, for large and small plants are thus equalized), the short-styled plants produce more seed than the long-styled, in the proportion of four to three.

In 1861 I tried the result in a fuller and fairer manner. I transplanted in the previous autumn a number of wild plants into a large bed in my garden, treating them all alike; the result was—

	No. of Plants.	No. of Umbels.	Weight of seed in grains.
Short-styled Cowslips ...	47	173	745
Long-styled Cowslips ...	58	208	692

These figures, reduced as before, give the following proportions :—

	Number of Plants.	Weight of seed in grains.	Number of Umbels.	Weight of seed in grains.
Short-styled Cowslips ...	100	1585	100	430
Long-styled Cowslips ...	100	1093	100	332

The season was much better this year than the last, and the plants grew in good soil, instead of in a shady wood or struggling with other plants in the open field; consequently the actual produce of seed was considerably greater. Nevertheless we have the same relative result; for the short-styled plants produced more seed than the long-styled in the proportion of three to two; but if we take the fairest standard of comparison, namely, the number of umbels, the excess is, as in the former case, as four to three.

I marked also some Primroses, all growing together under the same conditions; and we here see the product :—

	No. of Plants.	Total No. of Capsules.	Good Capsules.	Weight of seed in grains.	Or by Calculation :	Good Capsules.	Weight of seed.
Short-styled Primroses	8	49	40	16		100	40
Long-styled Primroses	9	68	50	10		100	20

The number of Primrose plants tried was hardly sufficient, and the season was bad; but we here again see (excluding the capsules which contained no seed) the same result in a still more marked manner, for the short-styled plants were twice as productive of seed as the long-styled plants.

I had, of course, no means of ascertaining the relative fertility of the two forms of the Chinese Primrose in a natural condition, and the result of artificial fertilization can hardly be trusted; but sixteen capsules from long-styled flowers, properly fertilized, produce 9·3 grains' weight of seed, whereas eight capsules of short-styled flowers produced 6·1 grains; so that if the same number, namely, 16 of the latter, had been fertilized, the weight of seed would have been 12·2, which would have been nearly in the proportion of four to three, as in Cowslips.

Looking to the trials made during two successive years on the large number of Cowslips, and on these facts with regard to common Primroses and Chinese Primroses, we may safely conclude that the short-styled forms in these species are more productive than the long-styled forms; consequently the anticipation that the plants having largely developed pistils with rougher stigmas, and having shorter stamens with smaller pollen-grains, would prove to be more feminine in their nature is exactly the reverse of the truth. If the species of *Primula* are tending to become dioicous, which possibly may be the case, the future hypothetical females would have short pistils, and the males would have short stamens; but this tendency is accompanied, as we shall presently see, by other conditions of the generative system of a much more singular nature. Anyhow, the possibility of a plant thus becoming dioicous by slow degrees is worthy of notice, as the fact would so easily escape observation.

In 1860 I found that a few umbels of both long-styled and short-styled Cowslips, which were covered by a net, did not produce seed, though other umbels on the same plants, artificially fertilized, produced an abundance of seed; and this fact shows that the mere covering in itself was not injurious. Accordingly, in 1861 I covered up under a similar net several plants just before they opened their flowers; these turned out as follows:—

	No. of Plants.	No. of Umbels produced.	Product of Seed.
Short-styled	6	24	1·3 grains, or 50 seeds.
Long-styled	18	74	Not one seed.

Judging from the exposed plants which grew all round in the same bed, and had been treated in every way exactly the same, except that they were exposed to the visits of insects, the six short-styled plants ought to have produced 92 grains' weight of seed instead of only 1·3; and the eighteen long-styled plants, which produced not one seed, ought to have produced above 200 grains' weight. The production of the 1·3 grain of seed in the smaller lot was probably due to the action of Thrips or some minute insect. This evidence is sufficient, but I may add that ten pots of Polyanthuses and Cowslips of both forms, protected from insects in my greenhouse, did not set one pod, though artificially fertilized flowers in other pots produced an abundance. So we see that the visits of insects are absolutely necessary to the fertilization of Cowslips. As the exposed plants produced an abundance of seed, the tendency to a dioicous condition, previously remarked on, might have been safely carried on, as we see that there is an effective agency already at work which would have carried pollen from one sex to the other.

What insects habitually visit Cowslips, as is absolutely necessary for their regular fertility, I do not know. I have often watched them, but perhaps not long enough; and only four times I have seen Humble-bees visiting them. One of these bees was gathering pollen from short-styled flowers alone, another had bitten holes through the corolla; and neither of these would have been effective in the act of fertilization: two others were sucking long-styled plants. I have watched Primroses more attentively during several years, and have never seen an insect visit them; yet from their close similarity in all essential respects to Cowslips, there can hardly be a doubt that they require the visits of insects. Hence I am led to suppose that both Primroses and Cowslips are visited by moths. All the species which I have examined secrete plenty of nectar.

In *Primula Sinensis*, when protected from insects and not artificially fertilized, the case is somewhat, but not materially, different. Five short-styled plants produced up to a given period 116 flowers, which set only seven capsules, whereas twelve other flowers on the same plants artificially fertilized set ten capsules. Five long-styled plants produced 147 flowers, and set sixty-two capsules; so that this form, relatively to the other, sets a far greater number of capsules: yet the long-styled protected flowers do not set nearly so well as when artificially fertilized; for out of forty-four flowers thus treated, thirty-eight set. These remarks apply only to the early setting of the capsules, many of which did not continue swelling. With respect to the product of seed, seven protected short-styled plants, which bore about 160 flowers, produced only half a grain of seed; they ought to have produced 120 grains: so that the short-styled plants, when protected from insects, are nearly as sterile as Cowslips. Thirteen long-styled plants, which bore about 380 flowers, and which as we have seen set many more capsules, produced 25·9 grains of seed; they ought to have produced about 220 grains in weight: so that although far less fertile than the artificially fertilized flowers, yet the long-styled *P. Sinensis*, when protected from insects, is nearly twenty-four times as fertile as the short-styled when protected from insects. The cause of this difference is, that when the corolla of the long styled plants falls off, the short stamens near the bottom of the tube are necessarily dragged over the stigma and leave pollen on it, as I saw by hastening the fall of nearly withered flowers; whereas in the short-styled flowers, the stamens are seated at the mouth of the corolla, and in falling off do not brush over the lowly seated stigma. In the Cowslip the corolla does not fall off; and both long-styled and short-styled plants are equally sterile when protected from insects. It is a rather curious case, that the falling of the corolla, or its remaining attached when withered, might have a considerable influence on the numbers of a plant, during a year unfavourable to the visits of the proper insects.

In three short-styled plants of *Primula auricula*, protected from insects, the flowers which I fertilized produced seed, but those which were not touched produced none.

In all the species of *Primula* the pollen readily coheres to any object. In all that I have observed, though the stamens and pistils differ in length relatively to each other in the different species, yet, in the two forms of the same species, the stigma of the one form stands at exactly the same height with respect to the corolla as the anthers of the other form. If the proboscis of a dead Humble-bee, or thick bristle, or rough needle be pushed down the corolla, first of one form, and then of the other, as an insect would do in visiting the two mingled forms, it will be found that pollen from the long-stamened form will adhere round the base of the proboscis, and will be left with certainty on the stigma of the long-styled form; pollen from the short stamens of the long-styled form will also adhere a little above the tip of the proboscis, and some will generally be left on the stigma of the other form. Thus pollen will be carried reciprocally from one form to the other. In withdrawing the proboscis from the long-styled form, with pollen adhering near the tip, there will be a good chance of some being left on the flower's own stigma, in which case there will be self-fertilization; but this by no means always occurs. In the short-styled form, on the other hand (and it is important to remember this), in inserting the proboscis between the anthers situated at the mouth of the corolla, pollen, as I repeatedly found, is almost invariably carried down and left on the flower's own stigma. Moreover minute insects, such as Thrips, numbers of which I have observed in Primrose flowers thickly dusted with pollen, could not fail often to cause self-fertilization. We positively know that the visits of large insects are necessary to the fertilization of the species of *Primula*; and we may infer from the facts just given that these visits would carry pollen reciprocally from one form to the other, and would likewise *tend* to cause self-fertilization, more especially in the short-styled (*i. e.* long-stamened) form.

These observations led me to test the potency of the two pollens with respect to the two stigmas in *P. veris*, *Sinensis*, and *auricula*. In each species four crosses can be tried; namely, the stigma of the long-styled by its own-form pollen and by that of the short-styled, and the stigma of the short-styled by its own-form pollen and by that of the other form. It is necessary to use and remember two new terms for these crosses: when the long- and the short-styled stigmas are fertilized by their own-form pollen the union is said to be "homomorphic;" when the long-styled and short-styled stigmas are fertilized by the pollen of the other form, the union is "heteromorphic." I speak of the "own-form pollen," because in the following homomorphic unions, in order to make the experiment perfectly fair, I never placed the pollen of the same flower on its own stigma, but, to avoid the possible ill effects of close interbreeding, I always used the pollen from another plant of the same form. In the following experiments all the plants were treated in exactly the same manner, and were carefully protected from insects as far as that is possible. I performed every manipulation myself, and weighed the seed in a chemical balance. Some of the capsules contained no seed, or only two or three, and these are excluded in the column marked "good pods." First for *P. Sinensis*, as the simplest case.

Primula Sinensis.—TABLE I.

	Number of flowers fertilized.	Total number of pods produced.	Number of good pods.	Weight of seed in grains.	By Calculation. Good Pods. { Weight of seed in grains.
Long-styled by own-form pollen (homomorphic union)	20	18	13	5·9	or as 100 to 45
Long-styled by pollen of short-styled (heteromorphic union)...	24	18	16	9·3	or as 100 to 58
Short-styled by own-form pollen (homomorphic union)	7	5	4	0·9	or as 100 to 22
Short-styled by pollen of long-styled (heteromorphic union)...	8	8	8	6·1	or as 100 to 76
Summary :					
The two homomorphic unions	27	23	17	6·8	
The two heteromorphic unions	32	26	24	15·4	

For the sake of comparison, we may reduce these latter figures as follows:—

	Number of flowers fertilized.	Number of good pods.	Weight of seed in grains.	Number of good pods.	Weight of seed in grains.
The two homomorphic unions	100	63	25	100	40
The two heteromorphic unions	100	75	48	100	64

In the first part of the upper table, the number of flowers fertilized and the simple result is shown; and at the right hand, for the sake of comparison, the calculated product of the weight of seed from 100 good pods of each of the four unions is given; showing that in each case the heteromorphic union is more fertile than the homomorphic union. Beneath we have a simple summary of the two homomorphic and the two heteromorphic unions. And lastly, for the sake of comparison, a calculation has been made from this summary; first, assuming that 100 flowers of both kinds of unions were fertilized; and then to the right hand, assuming that 100 good pods were produced from both unions. If we compare the result, we see that the flowers of the two heteromorphic unions produced a greater number of good pods, and a greater weight of seed, than the flowers of the two homomorphic unions; and again (and this is the fairest element of comparison, for accidents are thus almost eliminated), that the good pods from the two heteromorphic unions yielded more seed, in about the proportion of three to two, than those from the two homomorphic unions. The difference in weight from 100 capsules of the two forms is 24 grains, and this is equal to at least 1200 seeds.

Beneath we have Table II. of *P. veris*, or the Cowslip. The upper part is exactly the same as in the Table of *P. Sinensis*, and we see in each case that the heteromorphic is more fertile than the homomorphic union. The calculated results from the summary of the two homomorphic and the two heteromorphic unions are more complex than with the last species, as I wished to show that, however we proceed, the general result is the same. We see that the assumed hundred flowers, heteromorphically fertilized by the pollen of the other forms, yielded more capsules, more good capsules, and a greater weight of seed; but I rely little on this, as some whole umbels perished after being fertilized. The fairest element of comparison is to take the good capsules alone; and we here see that the 100 from the two heteromorphic unions yielded seed which in weight was as 54 to 35 from the 100 good capsules of the two homomorphic unions,—that is, nearly as three to two, as in the Chinese Primrose.

Primula veris.—TABLE II.

	Number of flowers fertilized.	Total number of pods produced.	Number of good pods.	Weight of seed in grains.	By Calculation. Good Pods. { Weight of seed in grains.
Long-styled by own-form pollen (homomorphic union)	20	8	5	2·1	or as 100 to 42
Long-styled by pollen of short-styled (heteromorphic union)...	22	15	14	8·8	or as 100 to 62
Short-styled by own-form pollen (homomorphic union)	15	8	6	1·8	or as 100 to 30
Short-styled by pollen of long-styled (heteromorphic union)...	13	12	11	4·9	or as 100 to 44
Summary :					
The two homomorphic unions	35	16	11	3·9	
The two heteromorphic unions	35	27	25	13·7	

For the sake of comparison, we may reduce these figures as follows :—

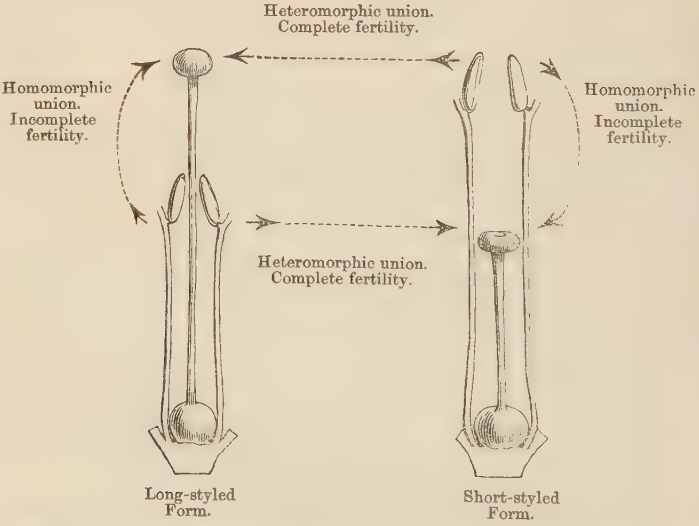
	Number of flowers fertilized.	Total number of pods produced.	Number of good pods.	Weight of seed in grains.	Total number of pods produced.	Weight of seed in grains.	Number of good pods.	Weight of seed in grains.
The two homomorphic unions	100	45	31	11	100	24	100	35
The two heteromorphic unions	100	77	71	39	100	50	100	54

With *P. auricula* I was unfortunate ; my few seedlings, except one poor plant, all came up short-styled ; and of these plants several died or became sick, owing to the hot weather and the difficulty of excluding insects and ventilating the corner of my greenhouse enclosed with net. I finally got only two pods from one union, and three from the other. The result is given in the following table ; and, though worth little, we here again see that the heteromorphic are far more fertile than the homomorphic unions.

Primula auricula.—Table III.

	Total number of pods produced.	Number of good pods.	Weight of seed in grains	Good Pods. } Weight of seed in grains.
Short-styled by own-form pollen (homomorphic union) ..	2	1	0·12	or as 100 to 12
Short styled by pollen of long-styled (heteromorphic union)	3	3	1·50	or as 100 to 50

Whoever will study these three tables, which give the result of 134 flowers carefully fertilized and protected, will, I think, be convinced that in these three species of *Primula* the so-called heteromorphic unions are more fertile than the homomorphic unions. For the sake of clearness, the general result is given in the following diagram, in which the dotted lines with arrows represent how in the four unions pollen has been applied.



We here have a case new, as far as I know, in the animal and vegetable kingdoms. We see the species of *Primula* divided into two sets or bodies, which cannot be called distinct sexes, for both are hermaphrodites; yet they are to a certain extent sexually distinct, for they require for perfect fertility reciprocal union. They might perhaps be called sub-dioicous hermaphrodites. As quadrupeds are divided into two nearly equal bodies of different sexes, so here we have two bodies, approximately equal in number, differing in their sexual powers and related to each other like males and females. There are many hermaphrodite animals which cannot fertilize themselves, but must unite with another hermaphrodite: so it is with numerous plants; for the pollen is often mature and shed, or is mechanically protruded, before the flower's own stigma is ready; so that these hermaphrodite flowers absolutely require for their sexual union the presence of another hermaphrodite. But in *Primula* there is this wide difference, that one individual Cowslip, for instance, though it can with mechanical aid imperfectly fertilize itself, for full fertility must unite with another individual; but it cannot unite with any individual in the same manner as an hermaphrodite Snail or Earth-worm can unite with any other one Snail or Earth-worm; but one form of the Cowslip, to be perfectly fertile, must unite with one of the other form, just as a male quadruped must and can unite only with a female.

I have spoken of the heteromorphic union in *Primula* as resulting in full fertility; and I am fully justified, for the Cowslips thus fertilized actually gave rather more seed than the truly wild plants —a result which may be attributed to their good treatment and having grown separately. With respect to the lessened fertility of the homomorphic unions, we shall appreciate its degree best by the following facts. Gärtner has estimated the degree of sterility of the union of several distinct species*, in a manner which allows of the strictest comparison with the result of the heteromorphic and homomorphic unions of *Primula*. With *P. veris*, for every hundred seeds yielded by the heteromorphic unions, only sixty-four seeds were yielded by an equal number of good capsules from the homomorphic unions. With *P. Sinensis* the proportion was nearly the same—namely, as 100 to 62. Now Gärtner has shown that, on the calculation of *Verbascum lychnitis* yielding with its own pollen 100 seeds, it yields when fertilized by the pollen of *V. Phœniceum* ninety seeds; by the pollen of *V. nigrum*, sixty-three seeds; by that of *V. blattaria*, sixty-two seeds. So again, *Dianthus barbatus* fertilized by the pollen of *D. superbus* yielded eighty-one seeds, and by the pollen of *D. Japonicus* sixty-six seeds, relatively to the 100 seeds produced by its own pollen. Thus we see—and the fact is highly remarkable—that the homomorphic unions relatively to the heteromorphic unions in *Primula* are more sterile than the crosses between several distinct species relatively to the pure union of those species.

The meaning or use of the existence in *Primula* of the two forms in about equal numbers, with their pollen adapted for reciprocal union, is tolerably plain; namely, to favour the intercrossing of distinct individuals. With plants there are innumerable contrivances for this end; and no one will understand the final cause of the structure of many flowers without attending to this point. I have already shown that the relative heights of the anthers and stigmas in the two forms lead to insects leaving the pollen of the one form on the stigma of the other; but, at the same time, there will be a strong probability of the flower's own pollen being likewise placed on the stigma. It is perfectly well known that if the pollen of several closely allied species be placed on the stigma of a distinct species, and at the same time, or even subsequently, its own pollen be placed on the stigma, this will entirely destroy the simultaneous or previous action of the foreign pollen. So again if the pollen of several varieties, including the plant's own pollen, be placed on the stigma, one or more of the varieties will take the lead and obliterate the effect of the others: but I have not space here to give the facts on which this conclusion is grounded. Hence we may infer as highly probable that, in *Primula*, the heteromorphic pollen which we know to be so much the most effective would obliterate the action of the homomorphic pollen when left on the flower's own stigma by insects; and thus we see how potent the dimorphic condition of the pollen in *Primula* will be in favouring the intercrossing of distinct individuals. The two forms, though both sexes are present in each, are in fact dioicous or unisexual. Whatever advantage there may be in the separation of the sexes, towards which we see so frequent a tendency throughout nature, this advantage has been here so far gained, that the one form is fertilized by the other, and conversely; and this is effected by the pollen of each form having less potency than that of the other on its own stigma.

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* Versuche über die Bastarderzeugung, 1849, s. 216.

Bearing on this view of the final cause of the dimorphism of the *Primulas*, there is another curious point. If we look at the right-hand figures of the four first lines in the previous tables of *P. Sinensis* and *veris*, we shall see that one of the homomorphic unions, namely, the short-styled by its own-form pollen, is considerably more sterile than the other; and in *P. auricula*, though here there is no other homomorphic union as a standard of comparison, this union is likewise excessively sterile. That the fertility of this union is really less in a marked degree than in the other three unions, we have an independent proof in the seeds germinating less perfectly and much more slowly than those from the other unions.

This fact is the more remarkable, because we have clearly seen that the short-styled form in the Cowslip in a state of nature is the most productive of seed. This form bears its anthers close together at the mouth of the corolla, and I observed long before I had ascertained the relative fertility of the four unions, in passing the proboscis of a dead Humble-bee or bristle down the the corolla, that in this form the flower's own pollen was almost certain to be left on its own stigma; and, as I wrote down at the time, the chance of self-fertilization is much stronger in this than in the other form. On this view we can at once understand the good of the pollen of the short-styled form, relatively to its own stigma, being the most sterile; for this sterility would be the most requisite to check self-fertilization, or to favour intercrossing. Hence, also, it would appear that there are four grades of fertility from the four possible unions in *Primula*; of the two homomorphic unions, as we have just seen, one is considerably more sterile than the other. In the wild state we know that the short-styled plants are more fertile than the long-styled; and we may infer as almost certain, that in the wild state, when the flowers are visited by insects, as is absolutely necessary for the production of seed, and when pollen is freely carried from one form to the other, that the unions are heteromorphic; if so, there are two degrees of fertility in the heteromorphic unions, making altogether four grades of fertility.

Two or three other points deserve a passing notice. The question whether the Primrose and Cowslip (*P. vulgaris* and *veris*) are distinct species or varieties has been more disputed and experimented on than in any other plant. But as we now know that the visits of insects are indispensable to the fertilization of these plants, and that in all probability the heteromorphic pollen of a Primrose would be prepotent on the stigma of a Cowslip over the homomorphic pollen of a Cowslip, the numerous experiments which have been made, showing that Oxlips appear amongst the seedlings of Cowslips, cannot be trusted, as the parent plants do not appear to have been carefully protected from insects*. I am far from wishing to affirm that pure Cowslips will not produce Oxlips, but further experiments are absolutely necessary. We may also suspect that the fact noticed by florists*, that the varieties of the Polyanthus never come true from seed, may be *in part* due to their habitually crossing with other varieties of the Polyanthus.

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* Mr. Sidebotham (Phytologist, vol. iii. pp. 703–5) states that he protected his plants from crossing; but as he gives in detail all the precautions which he took, and says nothing about artificial fertilization, we may conclude that he did not fertilize his plants. As he raised very numerous seedlings, he would have had to fertilize many flowers, if they had been really well guarded against the visits of insects. Hence I conclude that his results are not worthy of trust.

The simple fact of two individuals of the same undoubted species, when homomorphically united, being as sterile as are many distinct species when crossed, will surprise those who look at sterility as a special endowment to keep created species distinct. Hybridizers have shown† that individual plants of the same species vary in their sexual powers, so far that one individual will unite more readily than another individual of the same species with a distinct species. Seeing that we thus have a groundwork of variability in sexual power, and seeing that sterility of a peculiar kind has been acquired by the species of *Primula* to favour intercrossing, those who believe in the slow modification of specific forms will naturally ask themselves whether sterility may not have been slowly acquired for a distinct object, namely, to prevent two forms, whilst being fitted for distinct lines of life, becoming blended by marriage, and thus less well adapted for their new habits of life. But many great difficulties would remain, even if this view could be maintained.

Whether or not the dimorphic condition of the *Primulæ* has any bearing on other points in natural history, it is valuable as showing how nature strives, if I may so express myself, to favour the sexual union of distinct individuals of the same species. The resources of nature are illimitable; and we know not why the species of *Primula* should have acquired this novel and curious aid for checking continued self-fertilization through the division of the individuals into two bodies of hermaphrodites with different sexual powers, instead of by the more common method of the separation of the sexes, or by the maturity of the male and female elements at different periods, or by other such contrivances. Nor do we know why nature should thus strive after the intercrossing of distinct individuals. We do not even in the least know the final cause of sexuality; why new beings should be produced by the union of the two sexual elements, instead of by a process of parthenogenesis. When we look to the state in which young mammals and birds are born, we can at least see that the object gained is not, as has sometimes been maintained, mere dissemination. The whole subject is as yet hidden in darkness.

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* Mr. D. Beaton, in 'Journal of Horticulture,' May 28, 1861, pp. 154, 244.

† Gärtner, Bastarderzeugung, s. 165.

I will now only add that cases of dimorphism, like that of *Primula*, seem to be far from rare in the vegetable kingdom, though they have been little attended to. A large and important class of analogous facts will probably soon be discovered. Professor Asa Gray* informs me, that he and Dr. Torrey have described several Rubiaceous genera, in which some plants have exserted stamens, and others exserted pistils. "Mitchella offers an interesting instance of this structure from its relationship, through *Nertera*, to *Coprosma*, one of the few diœcious genera of *Rubiaceæ*, and in which the stamens are elongated in the male flowers and the styles in the females." The long-styled hermaphrodite flowers of Mitchella would probably be found more productive of seed than the short-styled; in the same way, but in a reversed manner, as in *Primula*, the short-styled flowers are more productive than the long-styled; from which fact I inferred that, if *Primula* were to become diœcious, the females would have short pistils and the males short stamens, these being the corresponding organs necessary for a heteromorphic union with full fertility. In the diœcious *Coprosma*, on the other hand, the females have long pistils, and the males have long stamens. These facts probably show us the stages by which a diœcious condition has been acquired by many plants.

Prof. A. Gray also informs me that another Rubiaceous genus (*Knoxia*) in India has been described by Dr. Wight, with a similar structure; and this, I am told, is the case with *Cinchona*. Several species of North American *Plantago* are dimorphic, as is *Rhamnus lanceolatus*, as far as its female organs are concerned. In the *Boragineæ*, Dr. Torrey has observed a strongly marked instance in *Amsinckia spectabilis*: in some dried flowers sent me by Prof. Gray, I find that the pistil in the one form is more than twice as long as in the other, with a corresponding difference in the length of the stamens; in the short-styled flowers the grains of pollen, as in *Primula*, apparently are larger, in the proportion of nine to seven, than in the long-styled flowers, which have the short stamens; but the difference can hardly be determined with safety in dried flowers. In *Mertensia alpina*, another member of the *Boragineæ*, Prof. Gray finds a new and inexplicable case,—namely, some specimens with the stamens and pistil sub-exserted, and other specimens with *both* organs seated low down the tube of the corolla. Dr. Torrey and Prof. Gray have designated all such plants as "diœciously dimorphous." In the *Labiatæ*, Mr. Bentham informs me that several species of *Ægiphyla*, and some of *Mentha*, are dimorphic like *Primula*. The case of *Thymus* is different, as I know from my own observations; but I will not here enlarge on this genus. Again, as I hear from Mr. Bentham, numerous species of *Oxalis* are similarly dimorphic. I can add the genus *Linum*. So that we already know of species (generally several in the same genus) having distinct dimorphic individuals, as far as structure is concerned, however it may prove in function, in no less than eight natural orders.

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* See also Prof. Asa Gray's 'Manual of the Botany of the N. United States,' 1856, p. 171. For *Plantago*, see p. 269.

With respect to *Linum*, I will not here enter on details, as I intend to try further experiments next summer; but I may state, that I observed many years ago two forms in *Linum flavum*, with both the pistils and stamens differing in length. In *Linum grandiflorum* there are likewise two forms which present no difference in their male organs, but the pistil and stigmatic surfaces are much longer in the one form than in the other. The short-styled form, I have good reason to believe, is highly fertile with its own pollen; whether it be more fertile with the pollen of the long-styled form, I cannot at present say. The long-styled form, on the other hand, is quite sterile with its own pollen: several plants grew in my garden, remote from the short-styled plants; their stigmas were coloured blue with their own pollen; but although they produced a vast number of flowers, they did not produce a single seed-capsule. It seemed a hopeless experiment; but I had so much confidence from my trials on *Primula*, that I put a little pollen from the short-styled plants on the stigmas (already blue with their own pollen) of twelve flowers on two of the long-styled plants. From these twelve flowers I got eight remarkably fine seed-capsules; the other flowers not producing a single capsule. The existence of plants in full health, and capable of bearing seed, on which their own pollen produces no more effect than the pollen of a plant of a different order, or than so much inorganic dust, is one of the most surprising facts which I have ever observed.

Notes on *Malvaceæ* and *Sterculiaceæ*. By GEORGE BENTHAM, Esq., P.L.S.

[Read June 20, 1861.]

BOTANISTS appear to be unanimous in bringing together the group of orders designated by Endlicher under the name of *Columniferæ*, by Brongniart under that of *Malvoideæ*, and included by Lindley in his alliance of *Malvales*. They are characterized generally by the valvate calyx, contorted petals, monadelphous or indefinite stamens, and syncarpous ovary; and as to habit, by alternate stipulate leaves often toothed or palmately lobed, and a great tendency to stellate pubescence. The subdivision of the group, however, has been the object of much diversity of opinion. Whilst A. de St. Hilaire proposed the adoption of two orders only, Malvaceæ and Tiliaceæ, the greater number of modern botanists have admitted one or two intermediate ones, Sterculiaceæ and Buettneriaceæ; whilst others enumerate as many as nine distinct orders, Malvaceæ, Bombaceæ, Sterculiaceæ, Lasiopetaleæ, Buettneriaceæ, Hermanniaceæ, Dombeyaceæ, Tiliaceæ, and Elæocarpeæ. The Tiliaceæ, including Elæocarpeæ, characterized by indefinite free or nearly free stamens with 2-celled anthers, have been the subject of a previous paper (Linn. Journ. v. 2nd Suppl.). I have now to offer a few observations on the Malvaceæ as understood by St. Hilaire, characterized by monadelphous stamens, or, in the very few cases where they are free, definite and alternate with the sepals.

There is so much intercommunity, both in habit and character, in the various orders or tribes of this group, that the proposal for their union, although not generally adopted, was perhaps the most in conformity to the general principles of the natural method; yet there is one character, derived from the one- or two-celled anthers, which seems to divide them into two large groups, Malvaceæ and Sterculiaceæ, accurately limited (with the exception of a very few species, whose affinities are, by other characters, placed beyond doubt) and not unnatural; and this classification we propose to adopt, in common with the majority of modern botanists, although not with the usual limits. For Bombaceæ, usually classed as a tribe of Sterculiaceæ, have the one-celled anthers of Malvaceæ; and, in their accessory characters, their soft wood, their staminal arrangement, the cotton within the capsule of so many of them, show a nearer connexion with some of the arborescent Hibisceæ than with any true Sterculiaceous genera. It is true that the smooth pollen-grains have been adduced as a positive character connecting them rather with Sterculiaceæ than with Malvaceæ, but its constancy is very far from being proved. The pollen has only been described in a very few genera. As far as my observation goes, it is always tuberculate or muricate in what are considered as true Malvaceæ; but so I have found it also in *Hampea*, in several Helicteroid genera, &c.; so that, in the present state of our knowledge, the pollen cannot be taken as furnishing an ordinal character.

Although the one-celled anthers are thus taken by common consent as the essential characters of Malvaceæ, on account of its remarkable constancy in genera otherwise related, yet it is of very little organic importance. It is not occasioned by the constant abortion of one cell, but by the two cells, placed end to end as in many distinctly two-celled genera, but confluent from a very early period. In many genera no trace of any transverse partition or even contraction can, I believe, be traced at any age; in others, in the young bud, there is a distinct contraction in the middle of the anther, showing its normal structure. *Helicteres*, which on many accounts belongs undoubtedly to Sterculiaceæ, shows, in regard to the anthers, the passage from the Malvaceous confluent anthers of *H. pentandra*, &c., to the Sterculiaceous distinctly two-celled ones of *H. angustifolia*, &c.; but here the contraction in the young anthers may, I believe, be found in all the species.

MALVACEÆ have been distributed into tribes, and the genera circumscribed with so much tact and ability by A. Gray, that I have little to propose in modification of his arrangement, except the addition of one or two genera which had not come under his observation, and the annexation of Bombaceæ,—in consequence of which I should propose reducing some of his tribes to the rank of subtribes, as will appear in the following enumeration of tribes and genera.

Tribus I. MALVEÆ. Columna staminea apice v. usque ad apicem antherifera. Styli rami tot quot ovarii loculi v. carpella. Carpella matura ab axi v. receptaculo secedentia (exceptis *Bastardia* et *Howittia*).

Subtribus 1. MALOPEÆ. Carpella inordinate congesta. Ovula solitaria, adscendentia.

* *Styli rami longitudinaliter stigmatosi.*

Genus:—1. Malope, *Linn.*

** *Styli rami apice stigmatosi.*

Genera :—2. Kitaibelia, *Willd.*; 3. Palava, *Cav.*

Subtribus 2. Eumalveæ. Carpella simplici serie verticillata. Ovula solitaria, adscendentia.

* *Styli rami intus longitudinaliter stigmatosi.*

Genera :—4. Althæa, *Cav.*; 5. Lavatera, *Linn.* (*Stegia*, Mœnch; *Saviniona*, Webb; *Navæa*, Webb); 6. Malva, *Linn.* (ex parte); 7. Callirhoe, *Nutt.*; 8. Sidalcea, *A. Gray*; 9. Napæa, *Linn.*

** *Styli rami apice stigmatosi.*

Genus :—10. Malvastrum, *A. Gray.*

Subtribus 3. Sideæ. Carpella simplici serie verticillata. Ovula solitaria, pendula.

* *Styli rami intus longitudinaliter stigmatosi.*

Genus :—11. Plagianthus, *Forst.* (*Philippodendron*, Poit.; *Asterotrichon*, Klotzsch; *Blepharanthemum*, Klotzsch; *Lawrencia*, Hook.; *Wrenciala*, A. Gray.

** *Styli rami apice stigmatosi.*

Genera :—12. Hoheria, *A. Cunn.*; 13. Anoda, *Cav.*; 14. Cristaria, *Cav.*; 15. Gaya, *H. B. & K.*; 16. Sida, *Linn.* (ex parte) (*Dictyocarpus*, Wight; *Fleischeria*, Steud.); 17. Bastardia, *H. B. & K.*

Subtribus 4. Abutileæ. Carpella simplici serie verticillata. Ovula 2–∞ (excepta *Wissadula divergente*), sæpius adscendentia, nunc alia pendula, alia adscendentia.

Genera :—18. Howittia, *F. Müll.*; 19. Kydia, *Roxb.*; 20. Wissadula, *Medik.*; 21. Abutilon, *Gærtn.* (*Beloere*, Shuttlew.; *Bastardiæ* sect. *Gayoides*, Endl.); 22. Sphæralcea, *A. de St. Hil.* (*Sphæroma*, Harv.; *Meliphlœa*, Zucc.); 23. Modiola, *Mœnch.*

Tribus II. Ureneæ. Columna staminea extus antherifera, apice truncata v. 5-dentata. Styli rami numero carpellorum dupli. Carpella 5, matura ab axi v. receptaculo secedentia.

Genera :—24. Malachra, *Linn.*; 25. Urena, *Linn.*; 26. Pavonia, *Cav.* (*Lebretonia*, Schranck; *Greevesia*, F. Müll.; *Lopimia*, Nees et Mart.; *Asterochlæna*, Garcke); 27. Goethea, *Nees & Mart.*; 28. Malvaviscus, *Dillen.* (*Achania*, Sw.).

Tribus III. Hibisceæ. Columna staminea extus antherifera, apice truncata v. 5-dentata, v. rarissime antherifera. Stylus in ramos tot quot ovarii loculi divisus v. subinteger. Capsula loculicide dehiscens, carpellis non secedentibus.

Genera :—29. Kosteletzkya, *Presl*; 30. Decaschistia, *W. & Arn.*;

31. Julostyles, *Thw.*; 32. Senra, *Cav.*; 33. Hibiscus, *Linn.* (*Bombycodendron*, Zoll.; *Lagunæa*, Cav.; *Abelmoschus*, Medik.; *Paritium*, A. de St. Hil.); 34. Thespesia, *Corr.*; 35. Fugosia, *Juss.* (*Redoutea*, Vent.); 36. Thurberia, *A. Gray*; 37. Gossypium, *Linn.* (*Sturtia*, R. Br.); 38. Lagunaria, *Don.*

Tribus IV. (v. Subordo) BOMBACEÆ. Columna staminea plus minus divisa in filamenta v. ramos 5–∞, singula 2–8-antherifera, v. rarius subintegra. Stylus integer v. in ramos tot quot ovarii loculos divisus. Capsula loculicide dehiscens v. indehiscens, carpellis non v. vix rarissime secedentibus.

Subtribus 1. ADANSONIEÆ. Folia digitata. Bracteolæ distinctæ v. 0.

* *Columna staminea superne in filamenta numerosa soluta.*

Genera:—39. Adansonia, *Linn.*; 40. Pachira, *Aubl.* (*Carolinea*, Linn. fil.); 41. Bombax, *Linn.* (*Eriotheca*, Schott; *Salmalia*, Schott).

** *Columna staminea 5-fida v. 5-dentata, ramis 2–3-antheriferis.*

Genera:—42. Eriodendron, *DC.* (*Erione*, *Campylanthera*, et *Gossampinus*, Schott); 43. Chorisia, *H. B. & K.*

Subtribus 2. MATISIEÆ. Folia simplicia palmatinervia v. saltem basi 3-nervia. Bracteolæ distinctæ v. 0.

* *Petala* 5. *Filamenta* 1-*antherifera*, 5–10-*adelpha v. libera.*

Genera:—44. Hampea, *Schlecht.*; 45. Scleronema, *Benth.*; 46. Cavanillesia, *Ruiz & Pav.* (*Pourretia*, Willd., non R. & P.).

** *Petala* 5. *Antheræ secus columnam v. ejus ramos adnatæ.*

Genera:—47. Matisia, *Humb. & Bonpl.*; 48. Quararibea, *Aubl.*; 49. Montezuma, *DC.*; 50. Ochroma, *Sw.*

*** *Petala* 0. *Antheræ* 10, *lineares, per paria ramis columnæ adnatæ, antheras* 5 *biloculares simulantes.*

Genera:—51. Cheirostemon, *Humb. & Bonpl.*; 52. Fremontia, *Torr.*

Subtribus 3. DURIONEÆ. Folia simplicia penninervia integerrima subtus uti inflorescentiæ lepidota. Involucrum calycem cingens, demum varie fissum. Fructus muricatus.

Genera:—53. Cullenia, *Wight*; 54. Durio, *Rumph.*; 55. Lahia, *Hassk.*; 56. Boschia, *Korth.* (*Heteropyxis*, Griff.); 57. Neesia, *Blume* (*Cotylephora*, Meisn.).

A detailed monograph of several of the above genera, especially of those which, like *Sida*, *Abutilon*, *Pavonia*, *Hibiscus*, &c., contain numerous widely spread species, is much wanted, but would lead me too far on the present occasion; nor can I stay to investigate or describe many apparently unpublished forms which we possess in our herbaria. There are, however, a few genera on which I should wish to add some observations, or to characterize some of the more remarkable new species.

PALAVA, *Cav.*

The *P. rhombifolia*, Grah., from Lima, is probably the same species as the *P. malvifolia*, Cav., of which the latter author had probably only examined undeveloped flowers, and thus described the petals as of the length of the calyx. *P. moschata*, Cav., is a very distinct species; and the following one, with the habit of a *Cristaria*, appears to have been hitherto overlooked.

P. DISSECTA, sp. n., tomentosa, foliis profunde bipinnatifidis dissectisve, lobis cuneato-oblongis obtusis integris v. 3–5-lobis, pedunculis calycibusque hispidis.

Hab. Peru, *Cuming*, n. 945; near S. Lorenzo, *Maclean*.

MALVA, *Linn.*

This genus, stripped as it has been by A. Gray of its American and South-African species, becomes at once more natural and better characterized. Amongst European ones, the *M. Sherardiana*, Linn., notwithstanding the almost constant presence of two small bracts, must be referred to *Sida*, of which it has the styles and the seeds. *M. Behriana*, Schlecht., Linnæa, xx. p. 633, from Australia, is *Lavatera plebeia*, Br.

PLAGIANTHUS, *Forst.*

Notwithstanding the close proximity of this Australian genus to *Sida*, most of the species have, under various names, been published as Sterculiaceous genera; for the longitudinal partition in the anthers (much more prominent than in the generality of Malvaceæ) has usually suggested the idea of their being really bilocular. In some species also the ovary is reduced to three, two, or even a single carpel, so as, at least in the latter case, to give readily a false idea of its structure; and one such species, very nearly allied to the original one of Forster, has even been considered as the type of a distinct natural order under the name of *Philippodendreæ*, the affinities of which have much puzzled those who only knew the plant from Poiret's figure and description. The true position of the group among Malvaceæ has now, however, been fully shown by Hooker, A. Gray, Garcke, and others, where, with the ovary and seeds of Sideæ, it is distinguished from the other genera of that subtribe by the styles either clavate or acute, stigmatic along their inner edge or surface as in most Malveæ.

Two genera have been generally distinguished—*Plagianthus* and *Lawrencia*; but the characters which separate them appear to be too inconstant and too little in conformity with habit to be considered as more than sectional. The ovary in *Plagianthus* consists usually of only one or two carpels, but sometimes of three; whilst in *Lawrencia*, although usually five, there are occasionally three only. The more or less clavate or attenuate styles vary also from species to species. The 5-angular calyx of *Lawrencia* is more constant, but even that is not always well marked; and in habit the smaller-leaved *Lawrencias* are much nearer to some of the *Plagianthi* than to *L. spicata*. I should therefore propose to include the whole of the following species in *Plagianthus*.

Sect. 1. PLAGIANTHUS. Calyx campanulatus angulis vix prominulis.

* *Styli apice valde dilatati. Carpella vulgo* 1–2, *rarius* 3.

1. *P. betulinus*, A. Cunn. Hook. fil. Fl. N. Zel. i. 29.—*P. urticinus*, A. Cunn.—*Philippodendron regium*, Poir. in Ann. Sc. Nat. Par. sér. 2. viii. p. 183, t. 3.—New Zealand.

2. *P. divaricatus*, Forst.; Hook. Bot. Mag. t. 3271; Hook. fil. Fl. N. Zel. i. 29.—New Zealand.

3. *P. sidoides*, Hook. Bot. Mag. t. 3396.—*Sida discolor*, Hook. Journ. Bot. i. 250.—*Asterotriche sidoides*, Link, Klotzsch et Otto, Ic. Pl. Rar. t. 8.—*Plagianthus Lampenii*, Lindl. Bot. Reg. 1838, Misc. p. 22.—Tasmania.

** *Styli apice clavati. Carpella vulgo* 5.

4. *P. pulchellus*, A. Gray; Hook. fil. Fl. Tasm. i. 49, excl. var. β.—*Sida pulchella*, Bonpl., Hook. Bot. Mag. t. 2753.—Tasmania and Victoria.

The *P. petiolaris*, Backh. MS., from Illawarra, and *Croton urticoides*, A. Cunn. MS., from the margins of Cox's and Macquarie's Rivers, appear to be the same species; but the specimens I have seen have none but male flowers. The *Sida pulchella*, Bonpl., has been described by DeCandolle as having 2-ovulate 2-aristate carpels, which is totally at variance with our plant. I have, however, ascertained (since the present paper was read), by the inspection of Bonpland's original specimens, that the reference is correct.

*** *Styli apice attenuati. Carpella vulgo 5.*

5. *P. tasmanicus.*—*Sida tasmanica,* Hook. fil. in Hook. Journ. Bot. ii. 412.—*P. pulchellus,* var. *β,* Hook. fil. Fl. Tasm. i. 49.—Tasmania; also Southern Australia, on the rivers Tambo and Buchan, *F. Müller.*

6. ? *P.* sp. ?—*Sida dictyocarpa,* Ferd. Müll. MS.—*Sida spicata,* Backh. MS., non Cav.—On the Brisbane River, *Fraser, F. Müller*; Kirkton on the Upper Hunter River, *Backhouse.*

The foliage, indumentum, and inflorescence are those of *P. sidoides*, but the flowers are more crowded and sessile. Calyx shorter, broadly campanulate. Carpels usually five, strongly reticulate. A very distinct species; but the specimens are insufficient to assign its exact place.

**** *Styli superne subclavati. Carpella ∞, matura membranacea, valde compressa.*

7. *P. Lyallii,* Hook. fil. MS.—*Hoheria Lyallii,* Hook. fil. Fl. N. Zel. i. 31, t. 11.—N. Zealand.

This plant appears to me to be much better placed in *Plagianthus* than in *Hoheria,* reducing the latter genus to the single *H. populnea,* which has terminal peltate stigmas and remarkably winged carpels.

Sect. 2. LAWRENCIA. Calyx 5-angulatus, sæpe turbinatus. Styli apice attenuati. Carpella 3–5, nonnulla sæpe abortientia.

8. *P. spicatus.*—*Lawrencia spicata,* Hook. Ic. Pl. t. 261, 262.—Tasmania and Southern and Western Australia, from Port Fairy to Swan River.

9. *P. glomeratus.*—*Lawrencia glomerata,* Hook. Ic. Pl. t. 417.—Swan River, *Drummond.*

10. *P. squamatus.*—*Lawrencia squamata,* Nees, Pl. Preiss. i. 242.—Swan River, *Preiss*; *Drummond,* 4th coll. n. 106.

11. *P. microphyllus,* F. Müll. Fragm. Phyt. Austr. i. 29.—Victoria, *F. Müller*; Swan River, *Drummond,* coll. 1845, n. 208, and 4th coll. n. 252.

SIDA, *Linn.*

Dictyocarpus, Wight, has already been restored to this genus; and *Fleischeria,* Steud. (Steetz in Pl. Preiss. ii. 365), consisting of the single *Sida calyxhymenia,* Gay (DC. Prod. i. 462), only differs from other species in the calyx more enlarged, spreading and membranous after flowering—a character which appears to us wholly insufficient to justify the establishing a monotypic genus.

BASTARDIA, *H. B. & K.*, and HOWITTIA, *F. Müll.*

These two genera differ from the whole tribe of Malveæ in their capsule truly loculicidal as in Hibisceæ, without any tendency to the septicidal separation so universal in other Malveæ. Yet the habit and the staminal column are so completely those of *Sida* and its allies, that they are better placed in their vicinity as exceptional genera, than removed to Hibisceæ, with which they have little else in common. *Bastardia* must, of course, be reduced, as proposed by Grisebach and others, to the two original species, *B. viscosa* and *B. bivalvis*, Kunth. The *B. crispa*, St. Hil., and *B. nemoralis*, St. Hil., have several ovules in each carpel, although most frequently only one comes to maturity. They form the section *Gayopsis* of *Abutilon*, a section including *A. asiaticum*, Don, &c., and proposed by Shuttleworth to be raised to the rank of a genus, under the name of *Beloere*.

WISSADULA, *Medik.*

This small genus, closely allied to *Abutilon*, is adopted by A. Gray and others on account of the transverse projection inside each carpel dividing it into two cells, analogous to the inner appendages which form the character separating *Callirhoe* from *Malva*, and *Modiola* from *Sphæralcea*. It should, however, include, as proposed by Planchon, the *Sida divergens*, Benth., notwithstanding the want of any ovule in the upper portion of the carpels, the lower portion containing a single one. Grisebach on this account retains it as a section of *Sida*, under the name of *Wissada*; but, besides the rudimentary transverse dissepiment and the habit, which separate it from *Sida* and bring it under *Wissadula*, the shape of the fruit indicates its connexion with the latter, and not with the former. In all *Sidas* the upper angle is on the inner edge next the axis, so that when lengthened into a point or awn these points are always erect or connivent; whilst in *Wissadula*, as in most *Abutilons*, the upper angles or points are more or less divergent or divaricate, giving a peculiar flat top to the fruit. In the remaining *Abutilons* (chiefly of the section *Gayopsis*) the carpels are rounded at the top, but never have the inner angles or connivent points of *Sida*.

ABUTILON, *Gærtn.*

The *A. vitifolium* (*Sida*, Cav.) and, perhaps, a few other South-Western American species differ slightly from the rest of the genus in the more clavate branches of the style with less strictly terminal stigmas; but, as far as I am aware, the character is scarcely sufficiently marked to form even a good section.

SPHÆRALCEA, *A. de St. Hil.*

Harvey proposes to distinguish under the name of *Sphæroma* two species which differ from the others, as *Lavatera* from *Malva*, by the bracts connate at the base, and which has appeared in the Cape species to be confirmed by a difference in habit. But when the American species come to be examined, it will be found that the free and connate bracts pass gradually the one into the other, without any relation to habit or other characters. As to the rule that if a character separates two good genera in one part of a natural order, it must be considered as generic throughout the order, it is a very unsafe one, and the attempted strict adherence to it has been one of the causes of the raising so enormous a number of isolated species to bad genera, and of the consequent confusion, in Cruciferæ, Umbelliferæ, Compositæ, &c.

Meliphlœa, Zucc., a single Mexican species, has been distinguished from *Sphæralcea* by its connate bracts, by the calyx marked inside at the base by a smooth five-lobed portion scarcely thickened enough to be called a disk, and by clavate styles with the stigmas less strictly terminal; but all these characters may be observed, although in a much less degree, in other species passing gradually into the typical form. It is probable, however, that, when better known, the red-flowered species, such as *S. umbellàta*, *S. rosea*, &c., may, with Zuccarini's *Meliphlœa*, form a good section of *Sphæralcea*, whilst *Sphæroma* would constitute a third section.

URENA, *Linn.*

As no character has been found to separate this genus from *Pavonia* except the glochidiate points covering the fruit, the *U. speciosa*, Wall., must be transferred to *Pavonia*, in which many species have connate bracts.

PAVONIA, *Cav.*

There are about 60 species known of this genus, varying considerably in habit and in several minor characters derived chiefly from the bracts and the shape and degree of dehiscence of the cocci; and it would require a careful monographic examination of the whole to determine how far the genus is divisible into good sections, and what are the limits to be assigned to it with reference to the closely allied genera *Urena*, *Goethea*, and *Malvaviscus*. *Le-*

bretonia, Schranck, with five broad bracts and indehiscent cocci (sometimes muricate almost as in *Urena*), and *Lopimia*, Nees and Mart., with numerous narrow bracts and the cocci enveloped in mucilage, have now been generally reunited with *Pavonia*, as being connected with other species by intermediate forms. An Australian variety of *P. hastata*, Cav., has been established by F. Müller as a genus under the name of *Greevesia*, as having dimorphous flowers—perfect ones with the usual petals, together with abnormal pentandrous ones with small closed corollas. This is hitherto, as far as I am aware, the only instance observed in Malvaceæ, as the *Stellarias* of the group of *Krascheninikowia* are among Caryophylleæ, but in neither case supplying a good generic character any more than in the numerous other orders where it is now known to occur.

Asterochlæna, Garcke, from the character given in the Bot. Zeit. 1850, p. 666, does not appear in any way to differ from other *Pavonias* with more or less dehiscent cocci.

Goethea, Nees et Mart., has also been united with *Pavonia*; yet, in two species known to me, the habit and inflorescence, the large coloured calyx, short corolla, &c., seem to indicate differences more important than those which separate *Urena*. The *G. semperflorens*, Mart., however, only known to me from Martius's figure, may possibly sufficiently connect *Goethea* with species of true *Pavonia* to justify the considering it as a section only.

Malvaviscus, Dillen., with erect petals and a baccate fruit, seems at first sight very different from *Pavonia*; but the former character occurs in several true *Pavonias*, and the succulence of the fruit is variable in degree in different species of *Malvaviscus*. It is, however, known only in a very few, and whether it passes or not into the slightly mucilaginous outer coating of the carpels of *Lopimia* remains to be ascertained. Another character has been pointed out, which, if true, may be important,—that is, that the carpels are said to alternate with the petals in *Malvaviscus*, and to be opposite them in *Pavonia*. I have been unable to verify this character satisfactorily in our dried specimens. It is only in the fresh flower that it can be ascertained whether it may not be due to a greater or less degree of torsion, to which there is a tendency in many Malvaceæ.

JULOSTYLES, *Thw.*

This is a Ceylon tree, which, from some general resemblance in calyx and in habit to *Kydia*, had been published by Gardner as a second species of that genus. Thwaites very properly established it as distinct on numerous grounds, and pointed out the truly Malvaceous character of its anthers. As the structure of the staminal column is also Malvaceous (except that the stamens appear to be limited to ten), as the pollen is remarkably muricate, and as the shape of the corolla with the dark spot at the base of the petals is so much like that of *Hibiscus*, there appears no reason against removing it to the tribe Hibisceæ of Malvaceæ, of which it has all the technical characters. The original species of *Kydia* must also be removed to Malvaceæ, as having truly one-celled anthers; but their shape, as well as the general structure of the staminal column, places the genus in Abutileæ rather than in Hibisceæ.

HIBISCUS, *Linn.*

This, the largest genus among Malvaceæ, comprising about 150 known species, varies more than any other in the calyx and bracts, in the woolly or glabrous seeds, &c.; but the characters appear to us to be too much blended together, or to pass too much one into the other in many instances, to be considered as more than sectional. We would therefore restore to *Hibiscus* the proposed genera *Bombycodendron*, Zoll. (sect. *Bombycella*, DC.), *Lagunæa*, Cav., *Paritium*, A. de St. Hil., and even *Abelmoschus*, Medik. On the other hand, *Thespesia*, Corr., appears to be sufficiently distinct in the calyx, in the clavate style, and in the hard, almost woody fruit, although not always indehiscent even in *T. populnea*, as well as in the apparently constant character of the obovoid, not reniform, seeds: the genus should, however, include the *H. Lampas* and its allies, forming Garcke's subsection *Tiparium* of DeCandolle's section *Azanza*.

Tribe BOMBACEÆ.

I have already given the principal reasons for which I should consider the Bombaceæ as a tribe or suborder rather of Malvaceæ than of Sterculiaceæ, and have observed that it is chiefly with the arborescent Hibisceæ that they stand in close connexion. *Hampea*, indeed, and some allied genera are scarcely separated from them, except by the filaments all terminating the staminal column without any barren truncate or 5-toothed edge; and the latter character is not even quite constant in Hibisceæ, for in some species of *Lagunaria* and *Gossypium* the column is divided to the summit into antheriferous filaments. Some genera of Bombaceæ present indeed exceptional characters, never or seldom observed either in other Malvaceæ or in Sterculiaceæ; but these are generally limited to a few genera only, or are too variously combined to warrant the maintenance of the group as a distinct order. Thus, the digitate leaflets of the five first genera are unknown in Malvaceæ and Tiliaceæ, and in Sterculiaceæ only occur in a very few species of *Sterculia*. The bracteoles in most Bombaceæ are small and inconspicuous, as in *Fugosia*, &c.; but in the subtribe Durioneæ they are united in an involucre which is often entire, completely enclosing the young bud, and bursting irregularly as the calyx enlarges. The calyx, sometimes truncate and toothed as in *Thespesia*, &c., or more rarely 5-cleft as in most Malvaceæ and Sterculiaceæ, is more frequently entire in the young bud, splitting irregularly into three to five lobes as the flower expands. This is rare in Malvaceæ and Sterculiaceæ, but occurs in the subtribe Brownlowieæ of Tiliaceæ. In *Ochroma*, *Cheirostemon*, and *Fremontia* the generally thick calyx-lobes are more or less expanded on the sides into thinner imbricating edges, which is quite exceptional among Columniferæ. The staminal column, usually more or less Malvaceous, is in *Eriodendron*, *Chorisia*, *Cheirostemon*, and *Fremontia* exceptionally divided into five lobes, each of which usually bears two long linear parallel adnate anthers, which might easily be taken at first sight for the parallel cells of single anthers, were it not that these are occasionally three instead of two, that the two are often not strictly parallel, one being longer or inserted rather higher up than the other, and that their real nature is shown by a comparison with the more numerous but similarly adnate anthers of *Matisia*, *Quararibea*, and *Ochroma*. As a further evidence of the close connexion of Bombaceæ with Hibisceæ, I may observe that since the above was read we have received some numbers of the 'Botanische Zeitung,' in which Alefeld proposes to remove *Gossypium*, *Thespesia*, and their allies from Hibisceæ to Bombaceæ.

BOMBAX, *Linn.*

Bombax differs chiefly from *Pachira* in its shorter flowers and in the dense wool enveloping the seeds within the capsule. In *Pachira humilis*, Spruce, and *P. Fendleri*, Seem., the flowers are longer than is usual in *Bombax*; yet as the capsule is woolly inside as in the latter genus, these two species must be transferred to it. The small-flowered *Eriothecas* and the Indian *Salmalia*, proposed as separate genera by Schott, do not appear to be founded on any better character than the greater or less degree of union of the stamens in pairs, which is variable in the same species; and we therefore propose their reunion with *Bombax*. Nor can we see any sufficient grounds for the adoption of *Erione*, *Campylanthera*, and *Gossampinus*, proposed by the same author for single species of *Eriodendron*.

SCLERONEMA, *Benth.*

I give this name to a North-Brazilian plant of Mr. Spruce's, which on a hasty determination I had thought might be a new species of *Myrodia*, taken in the vague general limits usually given to the genus; but, having now more closely investigated the characters of that and other Bombaceous genera, I find that it is much more nearly connected with *Hampea*. The fruit is still unknown, but the flower presents too many points of difference to admit of its being incorporated with that or any allied genus. I therefore propose it as a new genus with the following technical character:—

SCLERONEMA. *Char. gen.*—Calyx campanulatus, sub-5-lobus. Petala 5. Columna staminea brevis, apice divisa in filamenta ∞ (circa 20) superne incrassata, exterioribus brevioribus. Antheræ terminales, adnatæ, breves, uniloculares. Ovarium 2-3-loculare, ovulis in loculis geminis collateraliter ascendentibus. Stylus apice vix incrassatus, minute 2–3-dentatus. Fructus.........

Species unica. S. SPRUCEANA, Benth.—Arbor 100-pedalis, trunco 5 pedes diametro; corona patula. Stipulæ parvæ. Folia alterna, ovali-elliptica v. obovata, breviter et abrupte acuminata, 2–4-pollicaria, petiolo ½–1-pollicari, integerrima, coriacea, glaberrima, nitida, penninervia et basi subtrinervia, costa venisque utrinsecus primariis 6–8 obliquis subtus prominulis; venulæ transversæ, crebræ, reticulatæ. Flores haud magni, in axillis solitarii v. 2–3-ni. Pedicelli 3–4 lin. longi, crassiusculi, minute tomentelli. Bracteolæ sub calyce 2 v. 3, parvæ, calyce multo breviores. Alabastra obovoidea. Calyx apertus 3 lin. longus, fere ad medium sub-5-fidus. Petala duplo longiora, rubra, anguste oblonga, glabra, patentia, in unguem angustata. Tubus stamineus 2 lin. longus, filamenta, præsertim interiora, paullo longiora.

Hab. In North Brazil, on the Rio Uaupès, in *Caatingas* about the cataracts of Jauaratè, where these tall trees project here and there from the mass of low trees and shrubs. R. Spruce, n. 2548. Distributed under the name of *Myrodia parviflora*.

CARPODIPTERA, *Griseb.*

This genus, established by Grisebach on a Cuban plant of Wright's, and which I had at first, following that author, placed among Bombaceæ, proves on examination to differ from all others of the family as well in its stamens and its pendulous ovules as in its fruit and general habit. It is indeed so closely allied to *Berrya* among Tiliaceæ as only to be distinguishable from that genus by the singular, almost petaloid sessile stigmas, and we have accordingly now removed it to the latter family. Among the Kew-Garden drawings is one of a plant of unknown origin, which is evidently the same *Carpodiptera*, although there are three stigmas, instead of two as in the Cuban specimens.

QUARARIBEA, *Aubl.*

This genus is generally referred as a section to *Myrodia*, which it resembles in its fruit, although the flowers are very different. The andrœcium, with its one-celled anthers, is truly Bombaceous, near that of *Matisia*; whilst in *Myrodia* the anthers, in their two parallel or diverging cells, and in their usually definite number and arrangement, are decidedly Sterculiaceous, closely resembling those of several genera of the Helictereæ.

Subtribe DURIONEÆ.

Of the five genera forming this subtribe three are monotypic, and the two others have only two species each. They have, moreover, so much general similarity in their habit, in their scaly indumentum, in their involucre and fruit, that they might have been considered as constituting a single genus. Yet there is so much diversity in their calyx, in the presence and absence of petals, in their style, in the number of ovules, and especially in their andrœcium, that we have, for the present, thought it better to preserve the five genera as usually adopted. Two of them (*Neesia* and *Boschia*) have been occasionally placed among Tiliaceæ, from which they are readily known by their anthers.

The distinction between STERCULIACEÆ and BUETTNERIACEÆ, taken each in their general sense, although adopted by most botanists, rests on no one tangible character. In both, the number of stamens usually bears some definite ratio to that of the sepals. The supposed introrse anthers of Buettneriaceæ originated in a mistake. The "sterile stamens" of most tribes of Buettneriaceæ are the same thing as the "teeth of the staminal column" in *Helicteres* and its allies, and the degree of connation of the stamens varies in both supposed orders. In both also we meet with great diversity in the dehiscence of the fruit and in the embryo and albumen. If, however, we unite the two, rejecting only the

Bombaceæ already absorbed in Malvaceæ, we have a more definite group,—closely allied, it is true, to Malvaceæ, but readily separated by their two-celled anthers; and differing rather more from Tiliaceæ in habit, in their stamens either prominently monadelphous or definite either singly or in fascicles alternating with the sepals. In the few cases where genera with shortly monadelphous stamens have been admitted into Tiliaceæ, they may be known by their pendulous ovules with a ventral raphe, a character very frequent in Tiliaceæ, but, as I believe, unknown in Malvaceæ or Sterculiaceæ. At the same time, the large order of Sterculiaceæ thus formed, consisting of 41 genera and between 500 and 600 species, may be divided into the following seven distinct, well-marked, and for the most part natural tribes.

Tribus I. STERCULIEÆ. Flores unisexuales v. polygami. Calyx sæpe coloratus. Petala 0. Antheræ 5–15 ad apicem columnæ congestæ, brevissime 5-adelphæ v. annulatæ. Carpella fructus libera.

* *Antheræ inordinate congestæ. Semina albuminosa.*

Genera:—1. Sterculia, *Linn.* (*Triphaca*, Lour.; *Ivira*, Aubl.; *Southwellia*, Salisb.; *Chichæa*, Presl, v. *Mateatia*, Vell.; *Cavallium*, Schott; *Firmiana*, Marsigl.; *Erythropsis*, Lindl.; *Brachychiton*, Schott; *Pœcilodermis*, Schott; *Trichosiphon*, Schott; *Delabechea*, Lindl.; *Pterygota*, Schott; *Hildegardia*, Schott; *Scaphium*, Schott; *Pterocymbium*, R. Br.); 2. Tarrietia, *Blume* (*Argyrodendron*, F. Müll.).

** *Antheræ uniseriatim annulatæ. Albumen* 0.

Genera:—3. Cola, *Schott* (*Courtenia*, R. Br.); 4. Heritiera, *Ait.*; 5.? Tetradia, *R. Br.*

Tribus II. HELICTEREÆ. Flores hermaphroditi. Petala 5, decidua. Antheræ 5–15 ad apicem columnæ elongatæ sessiles v. stipitatæ, per 1–3 cum dentibus columnæ (raro obsoletis) v. staminodiis 5 linearibus v. ligulatis extrorsum alternantes. Cotyledones integræ.

* *Ovarium intra basin columnæ sessile. Antheræ sessiles.*

Genus:—6. Myrodia, *Schreb.* (*Lexarza*, Llav.).

** *Ovarium gynophoro columnæ adnato fultum. Antheræ sessiles. Calyx clavato-campanulatus.*

Genera:—7. Reevesia, *Lindl.*; 8. Ungeria, *Endl.*

*** *Ovarium gynophoro columnæ adnato fultum. Antheræ stipitatæ. Sepala demum libera.*

Genera:—9. Kleinhovia, *Linn.*; 10. Helicteres, *Linn.* (*Methorium*, Schott; *Oudemansia*, Miq.; *Isora*, Schott; *Alicteres*, Schott; *Orthothecium*, Schott); 11. Pterospermum, *Schreb.*

Tribus III. ERIOLÆNEÆ. Flores hermaphroditi. Petala 5, decidua. Antheræ ∞ a medio ad apicem columnæ extrorsum stipitatæ. Staminodia 0.

Genus:—12. Eriolæna, *DC.* (*Wallichia*, DC.; *Microlæna*, Wall.).

Tribus IV. DOMBEYEÆ. Flores hermaphroditi. Petala 5, plana, sæpius persistentia. Antheræ 10–20 v. in *Melhania* 5, ad apicem columnæ breviter cupulatæ, rarius elongatæ, stipitatæ, loculis parallelis. Ovarium sessile. Cotyledones bifidæ.

* *Stamina* 20, *omnia antherifera subuniseriata.*

Genera:—13. Ruizia, *Cav.*; 14. Astiria, *Lindl.*

** *Stamina per* 2–3 *rarius solitaria cum staminodiis* 5 *alternantia.*

Genera:—15. Dombeya, *Cav.* (*Assonia*, Cav.; *Xeropetalum*, Del.; *Astrapæa*, Lindl.; *Hilsenbergia*, Boj.); 16. Trochetia, *DC.*; 17. Pentapetes, *Linn.* (*Eriorhaphe*, Miq.); 18. Melhania, *Forsk.* (*Brotera*, Cav.; *Pentaglottis*, Wall.; *Cardiostegia*, Presl; *Vialia*, Vis.).

Tribus V. HERMANNIEÆ. Flores hermaphroditi. Petala 5, marcescentia, plana. Stamina 5, basi breviter, rarius in columnam coalita. Staminodia 0 v. minute dentiformia. Cotyledones integræ.

* *Ovarii loculi ∞-ovulati. Semina reniformia, embryone curvato.*

Genera:—19. Hermannia, *Linn.* (*Trichanthera*, Ehrenb.); 20. Mahernia, *Linn.*

** *Ovarii loculi* 2-*ovulati. Semina obovoidea v. ellipsoidea, embryone recto.*

Genera:—21. Physodium, *Presl*; 22. Melochia, *Linn.* (*Riedleia*, Vent.; *Mougeotia*, H. B. et K.; *Anamorpha*, Karst. et Tri.; *Physocodon*, Turczan.; *Lochemia*, Arn.; *Altheria*, Thou.;

Visenia, Houtt.; *Aleurodendron*, Reinw.; *Glossospermum*, Wall.); 23. Dicarpidium, *F. Müll.*; 24. Waltheria, *Linn.* (*Asteropus*, Spreng.).

Tribus VI. BUETTNERIEÆ. Flores hermaphroditi. Petala 5, basi concava, v. in cucullam unguiculatam dilatata, apice acuminata, ligulata, v. rarius nuda. Antheræ 5–15, rarius ∞, ad sinus urceolæ v. cupulæ dentatæ v. lobatæ per 1–3, rarius per 4–5, sessiles v. stipitatæ.

* *Antheræ inter staminodia* 2–∞.

Genera:—25. Glossostemon, *Desf.*; 26. Abroma, *Jacq.*; 27. Theobroma, *Linn.*; 28. Herrania, *Goud.*; 29. Guazuma, *Plum.* (*Bubroma*, Schreb.; *Diuroglossum*, Turczan.).

** *Antheræ inter staminodia solitariæ, nunc triloculares.*

Genera:—30. Ayenia, *Linn.* (*Cybiostigma*, Turczan.); 31. Buettneria, *Linn.* (*Pentaceros*, G. F. Mey.); 32. Rulingia, *R. Br.* (*Achilleopsis*, Turczan.); 33. Commersonia, *Forst.* (*Medusa*, Lour.).

Tribus VII. LASIOPETALEÆ. Flores hermaphroditi. Petala 0 v. squamæformia. Stamina basi leviter connata, 5 antherifera sepalis alterna, sterilia totidem v pauciora v. 0.

* *Antheræ 2-rimosæ. Carpella matura distincta v. solitaria.*

Genera:—34. Seringia, *Gay*; 35. Keraudrenia, *Gay*.

** *Antheræ 2-rimosæ. Capsula loculicide 3–5-valvis.*

Genera:—36. Thomasia, *Gay* (*Leucothamnus*, Lindl.; *Rhynchostemon*, Steetz); 37. Hannafordia, *F. Müll.*; 38. Guichenotia, *Gay*.

*** *Antheræ 2-porosæ. Capsula loculicide 3–5-valvis.*

Genera:—39. Sarotes, *Lindl.* (*Ditomostrophe*, Turczan.); 40. Lasiopetalum, *Sm.* (*Corethrostyles*, Endl.; *Asterochiton*, Turczan.); 41. Lysiosepalum, *F. Müll.*

STERCULIA, *Linn.*

This large genus presents considerable diversity in foliage, in the size, shape, and colour of the calyx, in the size, shape, consistence, and degree of dehiscence of the carpels, &c., and it is upon these characters chiefly that Schott (Meletemata, pp. 32 & 33) proposed the dividing it into thirteen distinct genera. Endlicher, however, considering them to be of minor importance, in his 'Genera Plantarum' reunited them all as sections of *Sterculia*, with the ex-

ception of *Pterygota*, characterized by its winged seeds. Brown has since (Pl. Jav. Rar. p. 224), with his usual perspicuity, pointed out the more important characters to be derived from the arrangement of the anthers and the structure of the seed. He reunites many of Schott's genera with *Sterculia*, but still admits ten distinct ones, including two not mentioned by Schott. Some of these are monotypic, and founded on the position of the radicle with relation to the hilum—next to it, at the opposite end, or between the two. Important, however, as similar characters are in most cases, they can yet be regarded only as artificially sectional when separating single species not otherwise distinct from the main group. In the case of *Firmiana*, the two species proposed to be generically united, as having in common the intermediate position of the radicle, are in habit and in their calyx as different from each other as any two species of the whole group. But we have no hesitation in adopting as a good genus the African *Cola* (including *Courtenia*); for there are several species at once distinguished from *Sterculia* by their anthers adnate in a single ring, and by their want of albumen, accompanied by other minor characters. *Courtenia*, with divaricate instead of parallel anther-cells, appears better considered as a section than as a genus; for neither here, nor in other Sterculiaceous genera where the same diversity occurs, does it entail any other tangible differences. *Tetradia*, Br., must also be provisionally admitted; for the fruit and seed are as yet unknown, and may present characters corroborative of those derived from the flower. But we would restore to *Sterculia*, as mere sections, *Firmiana*, *Brachychiton*, *Pterygota*, *Hildegardia*, *Scaphium*, and *Pterocymbium*; including in *Brachychiton* the *Delabechea* of Lindley, in which we find the radicle next the hilum as stated by Brown, not remote from it as described by Lindley.

TARRIETIA, *Blume*.

This genus, allied in most respects to *Sterculia*, has the indumentum and inflorescence of *Heritiera*, with much smaller flowers and very peculiar samaroid carpels. It includes an Australian species published by F. Müller under the name of *Argyrodendron*. The leaves are digitately compound, with five leaflets according to Blume's figure and description, three only in the specimens distributed by Miquel as Blume's species, as well as in the Australian species.

MYRODIA, *Schreb*.

We have already stated our reasons for excluding from *Myrodia*, and referring to Bombaceæ, the *M. longiflora*, forming the genus *Quararibea*, Aubl., as well as the species I had provisionally named in Spruce's plants *M. breviflora*, but which I have above described under the name of *Scleronema*. On the other hand, Endlicher proves to have been correct in his suggestion that *Lexarza*, Llave, belongs to *Myrodia*. Specimens agreeing in every respect with that author's description of his *L. funebris* are in the Hookerian herbarium, from Oaxaca, *Andrieux*, n. 512, from Papantla, *Liebmann*, and from near Sonsonate in San Salvador, *Sutton Hayes*. The flowers are considerably larger than in *M. turbinata*, from which it may be thus distinguished :—

> *M. funebris*, foliis subtus ad axillas venarum tomentoso-barbatis, pedicellis calyce brevioribus 2–3-bracteatis, antheris 25–30.—*Lexarza funebris*, Llave in Llave et Lex. Nov. Veg. Descr. fasc. ii. p. 7.

DOMBEYA, *Cav.*

In a paper of Dr. Planchon's in the 6th vol. of the 'Flore des Serres' (which we have been unable to procure, and which is therefore only known to us from the abstract in Walpers' 'Annales,' iv. p. 325), the genus *Dombeya* is well characterized and divided into sections; and *Xeropetalum*, Delile, is correctly included. We would also agree with him in considering the *Astrapæa viscosa*, Bot. Mag., and its allies as a section only of *Dombeya*, in which the staminal tube exceeds the ovary; but, in so doing, it does not appear possible to exclude *Hilsenbergia*, Boj., and *Astrapæa*, Lindl., which only differ in the staminal tube being still longer. Nor can we reject *Assonia*, Cav., which only differs slightly in the bracts from the smaller-flowered, short-columned species. Thus constituted, *Dombeya* forms a well-marked and natural genus of about 24 species, only separated, however, from *Ruizia* and *Astiria* by the sterile stamens or lobes of the column.

TROCHETIA, *DC.*

This genus, extended to its proper limits, becomes a very natural one, differing from *Dombeya* in its inflorescence and the shape of its flowers, in the more coriaceous calyx, and more numerous ovules in each cell of the ovary; from *Pentapetes* in its arborescent habit, in the calyx, and in the style more divided at the top; from *Melhania*, into which some species have been hitherto placed, it is still more distinct in habit and calyx, and in the anthers always 2, 3 or 4 between each two sterile stamens, instead of one only as in *Melhania*. The species we have seen are *T. grandiflora*, Lindl., with the anthers in fours between each two sterile stamens; *T. uniflora*, DC., and *T. parviflora*, Boj., with the anthers in threes; and *T. decanthera* (*Melhania decanthera*, DC.), *T. laurifolia* (*Melhania laurifolia*, Boj.), *T. erythroxylon* (*Melhania erythroxylon*, Ait.), and *T. melanoxylon* (*Melhania melanoxylon*, Ait.), all with two anthers only between each two sterile ones. All the species are from Mauritius or Madagascar, except the two last, which are from St. Helena—or rather *were*, for both are now said to be extinct. This distribution of so marked a genus over these distant islands, without any traces of it (as far as known) in the intermediate continent, may suggest some curious speculations as to the gradual extinction of ancient floras. These two St. Helena species are indeed described as pentandrous only; but I have certainly found the anthers in pairs in all the specimens I have seen, although with their short filaments united: that is, however, partially the case in some of the Mauritius species.

Pentapetes, *Linn.*

This genus, occasionally made the receptacle of several doubtful Dombeyeæ, is now reduced to the single *P. phœnicea*, Linn.; for the *P. angustifolia*, Bl., is generally admitted to be a mere variety. Miquel has indeed distinguished it as a genus under the name of *Eriorhaphe*; but on carefully studying his description, I find every part of it (including the nerve-like plumose placenta, whence he derived his name) applicable to the common *P. phœnicea*, except, perhaps, the number of anthers, 10 only instead of 15—that is, two instead of three between each two sterile stamens. From having observed, however, that one or two anthers are wanting in some flowers of our specimens, I should suspect that the number 10 was accidental in the flower examined by Miquel.

Melhania, *Forsk.*

Melhania, deprived of the arborescent species referred as above to *Trochetia*, and including *Brotera*, Cav., *Pentaglottis*, Wall., *Cardiostegia*, Presl, and *Vialia*, Vis., becomes a very natural and well-defined genus, distinguished from all other Dombeyeæ by the anthers solitary between each two sterile stamens, and readily known by their habit approaching that of *Serræa* among Malvaceæ rather more than that of *Hermannia*, to which it has been compared. It includes about sixteen species, dispersed over Africa and the warmer, drier regions of Southern Asia and Northern Australia.

MELOCHIA, *Linn.*

We follow A. Gray and others in referring to this genus, as sections, not only *Riedleia*, Vent., including *Mougeotia*, H.B. et K., *Lochemia*, Arn., and *Altheria*, Thou., but also *Visenia*, Houtt., to which belong *Aleurodendron*, Reinw., and *Glossospermum*, Wall. As to *Physodium*, Presl, from the fragmentary specimens of two Mexican species in the Hookerian herbarium, it appears to have a very different habit, and perhaps the very large Physalis-like mature calyx may suffice to keep it distinct, but it requires to be better known before the point can be decided. The recently proposed genus *Anamorpha*, Karst. et Tri., and the two species of *Physocodon*, Turczan., are all founded on the *Melochia* (*Mougeotia*) *inflata*.

GLOSSOSTEMON, *Desf.*

This is a Persian plant, not very common in our herbaria, but interesting in the structure of its andrœcium, as affording perhaps some clue to the explanation of the anomalies observed in the homology of the flowers of Sterculiaceæ with respect to the position of the stamens. We have seen that the staminal column in this Order is usually divided into a definite number of barren or antheriferous teeth or filaments, which is usually some multiple of the sepals or petals. In a very few genera (e. g. *Astiria*, and probably *Assonia*) these filaments, four times as many as the sepals, all bear anthers, and are all apparently in a single row and equidistant—an occasional occurrence in different Orders of various staminal homologies: but in the majority of Sterculiaceæ, the five innermost divisions, *always opposite the sepals*, are without anthers, and take the name of teeth or staminodia, according to their degree of development; and between them, and consequently more or less *alternate with the sepals* or opposite the petals, are 1, 2, or more sessile or stipitate anthers, always turned outwards and lying outside the staminodia in the bud. In a few genera (e. g. *Waltheria* and some *Melochias*) the staminodia almost or even totally disappear, and there remain only 5 stamens, connate in a ring or cup at the base, but each tapering into one anther-bearing filament opposite the petal, instead of alternating with it as is usually the case where the stamens and petals are isomerous. It has been attempted, especially by A. Gray, to explain this anomaly as a case of *dédoublement*; that is to say, by supposing that each stamen with its corresponding petal arises from the splitting of one homoogical leaf; the whole flower consisting of three whorls only, of five leaves each, the outer one forming the calyx, the next the petals and stamens, and the inner one the carpels. But when we consider that in the whole group of Columniferæ the petals are either perfectly distinct and sometimes distant from the staminal column, or, if they adhere to it near the base, the attachment is superficial only, the vascular systems remaining perfectly distinct, and that even this attachment is wanting in those genera where *dédoublement* is most relied upon, we must have something more than mere conjecture, some strong cases of intermediate structure, to counteract the evidence of our senses, and establish in theory that two totally disconnected organs are, in fact, branches of one organ.

It is well known that the (homological) leaf is very ready to ramify laterally—in its own plane; but, as far as my experience extends, ramification in a direction at right angles to that plane, either by the production of excrescences from either surface, or by anything approaching to a splitting or separation of the two surfaces, is confined to the three following categories:—

1. The production of epidermal excrescences, such as hairs, prickles, &c., never converted into real organs.

2. Prolification, the result of plethora or of some accidental determination of sap to particular points, resulting in abnormal foliaceous appendages, or adventitious roots and buds, which may become independent individuals, but never efficient organs of the mother-plant.

3. The production of petiolar glands, which alone can have any bearing on our present case. These glands, which I have called petiolar to distinguish them from several other bodies bearing usually the same name of glands, are not, however, strictly confined to the petiole. In most stem-leaves where they occur, there are two or a single one of them at or near the summit of the petiole or the base of the limb; but they are sometimes more numerous, irregularly placed on the petiole, rarely on some of the principal veins or in their axils, but not unfrequently on the margin of the leaf at the extremity of the principal veins; and they are usually disk-shaped, concave, or cup-shaped. In bracts they sometimes attain a size very large in proportion to the rest of the bract. In the petal they are very apt to assume the form of an entire or two-lobed scale at the base of the lamina or on the claw, sometimes as large as the rest of the petal, sometimes reduced to a mere concavity in the petal, or to a slight discoloration or alteration in the texture of its surface. In the stamen, according to

views I stated many years ago (Hook. Kew Journ. Bot. i. 358), and of which I have seen no refutation, these glands are represented by the anther-cells, the petiole by the filament and connective, and the lamina either totally abortive or represented by petaloid appendages to the connective. Keeping this theory in view, we may well conceive that a *dédoublement* of the petal may produce the inner petaloid scale of some Sapindaceæ, Violaceæ, Bixaceæ, &c., or the fimbriate scales in the tube of *Cuscuta* and other gamopetalous flowers, or the corona of *Passiflora*, the cup-shaped nectary of *Narcissus*, &c.; or, again, that a *dédoublement* of the stamens may result in the staminal corona of Asclepiadeæ when arising from the gynostegium. But that there is anything of the kind in Sterculiaceæ is, I think, fully disproved by the Buettnerieæ, where this supposed formation has been most relied upon; for here the petiolar gland of the petal-leaf forms the apex of the hood, connivent over or adhering to the staminal column, and is perfectly distinct in origin and position from the anther which it so curiously encloses*.

How then are we to account for the disturbance occurring in Sterculiaceæ of the usual alternation in the staminal whorls? I find that on soaking the andrœcium in several genera, and more especially in *Glossostemon*, it separates very readily into five bodies (adelphia), normally alternating with the petals, each one ending in a point or appendage (the teeth, barren lobes, or staminodia of the staminal column), and bearing the anthers on its margin on each side of the central point. Might we not consider each such body or fascicle of stamens as one staminal leaf, with branched veins, the central vein bearing no anther (or altered gland), the lateral branches each terminating in an anther (or altered gland) corresponding to the marginal glands on the stem-leaves of several species of *Homalium*, *Ranara*, Euphorbiaceæ, &c.? Where the number of anthers between each two staminodia is an even one (2, 4, 6 or 8), the staminal leaf has the same number of anthers on each side of the central nerve; where it is an odd one (1, 3, or 5), there is one more on one side than on the other,—a circumstance readily explained by the great tendency to obliquity in the parts of the floral whorls, where the æstivation is so strongly contorted. In confirmation of this view I may also observe, that in *Melhania* I never find the anther-bearing stamen exactly opposite the centre of the petals, but somewhere between the margin and the midrib*.

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* The supposed lateral *dédoublement* in the staminal leaves of the inner whorl in Cruciferæ is, to my mind, equally mythical; and I hope, on an early occasion, to lay before the Society my reasons for coming to this conclusion.

If the supposition, or as some would say conjecture, that the andrœcium of most Sterculiaceæ consists of five leaves, each bearing 1, 2, or more marginal anthers, be admitted, we must, in order to account for the internal position of the terminal point and for the extrorse direction of the anthers, further suppose that the edges of the leaf are slightly revolute in æstivation, not involute or inflexed as is usually the case with staminal leaves when not valvate or open. Similar exceptions to the ordinary æstivation occur, however, in other instances. Ordinary extrorse anthers do not indeed necessarily involve such an explanation, for petiolar glands may occur on the back as well as on the front of the leaf; but in many Laurineæ for instance, where the stamens are in three or four series, there is evidently a diversity in their æstivation, those of the outer series being involute, and the inner ones revolute.

ABROMA, *Jacq.*

The so-called strophiola in this genus is not an expansion of the hilum of the seed, nor yet of each separate funiculus, but a projection of the general placenta upon which the seeds are separately attached.

A. nitida, Pœpp. et Endl., belongs to *Herrania*, as well as the *A. Mariæ*, Mart., already referred to that genus.

GUAZUMA, *Plum.*

The genus *Diuroglossum*, Turczan., described in the Moscow Bulletin, 1852, is nothing but the common *Guazuma tomentosa*.

AYENIA, *Linn.*

In this genus and in a few species of the closely allied *Buettneria*, the anthers, solitary between each two sterile stamina or teeth of the andrœcium, have three parallel cells instead of two. This seems to indicate that the anther is compound, and may admit of two solutions. Grisebach suggests that the three cells may represent the three anthers of *Guazuma*, which have divaricate but distinct cells, but that here, by their closer combination, these divaricate cells have become completely confluent, without any trace of a transverse separation or contraction; and that we have thus the one-celled anthers of Malvaceæ, thereby doing away with the chief distinctive character of the two orders. I have, however, in vain searched for any species, either of *Ayenia* or *Guazuma*, showing any intermediate state between the ordinary anthers of the two genera; and in all other respects the two genera, though not inappropriately following each other in the linear series, have wide constitutional differences, in the calyx, the petals, the number of ovules, the styles, and, above all, in the embryo. On the other hand, in the great majority of *Buettnerias* the anthers have two parallel cells, which have as completely the appearance of belonging to one anther only as those of *Rulingia*; and when the third cell is present, might it not be considered as the half of an anther belonging to the adjoining staminal leaf, under the theory above suggested in explanation of the andrœcium of Sterculiaceæ? The three-celled anthers of *Ayenia* would then be explained as consisting of one complete two-celled, and one dimidiate anther.

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* Whilst suggesting the above explanation of the abnormal position of the stamens in Sterculiaceæ, I am well aware that the fact of the outer stamens being opposite the petals in Geraniaceæ and their allies must be accounted for on other grounds.

Cybiostigma of Turczaninow is founded on the common *Ayenia magna*, L., and a closely allied species, and has nothing to separate it generically from the other species.

RULINGIA, *R. Br.*

Achilleopsis, Turczan. (Walp. Ann. ii. 165), does not appear to be sufficiently distinct from *Rulingia*. I do not find the stamens quite free from the base, although much more shortly united than in most *Rulingias*.

LASIOPETALEÆ.

In this tribe, entirely Australian, where the petals are wanting or rudimentary, the andrœcium may be formed on a somewhat different principle from that of the other Sterculiaceæ. The stamens of the outer whorl opposite the sepals are reduced to barren filaments or, like the petals, entirely deficient; and the five anther-bearing stamens, alternate with the sepals as in other pentandrous Sterculiaceæ, may, however, really belong to the inner staminal whorl.

The genera of this tribe have probably been too much multiplied on characters of very little importance. Even the difference in the dehiscence of the anthers, by short pores or long slits, is not always clearly marked; and although we have still availed ourselves of it as distinguishing considerable groups, these are not so natural as could have been wished. The two first genera, *Seringia* and *Keraudrenia*, are well separated from all the others by their ripe carpels distinct or solitary, not forming a loculicidal capsule; and the two are equally well distinguished by the seeds ellipsoid with a straight embryo in *Seringia*, reniform with a curved embryo in *Keraudrenia*. The calyx and habit of the former also approach those of *Commersonia*, whilst those of *Keraudrenia* are nearer to *Thomasia* and *Lasiopetalum*. But *Seringia* must be understood as originally limited by Gay, and *S. nephrosperma*, F. Müll., transferred to *Keraudrenia*. Of the remaining six genera which we have adopted, three (*Thomasia*, *Guichenotia*, and *Hannafordia*) have the anthers opening in pores; and in three (*Sarotes*, *Lasiopetalum*, and *Lysiosepalum*) they open in slits. *Guichenotia*, *Hannafordia*, and *Sarotes* are distinguished by their calyx marked when enlarged by 3 or 5 prominent ribs on each sepal, and *Hannafordia* by the lanceolate petals much more developed than in other Lasiopetaleæ; and lastly, *Lysiosepalum*, F. Müll., which I have not seen, is said to be well marked by the sepals entirely free from the base: but all these must be admitted to be rather artificial than natural distinctions.

As to the other proposed genera, we would reduce *Leucothamnus*, Lindl., and *Rhynchostemon*, Steetz, to *Thomasia*; *Ditomostrophe*, Turczan., to *Sarotes*; and *Corethrostyles*, Endl., and *Asterochiton*, Turczan., to *Lasiopetalum*.

The apparently ternately verticillate leaves of *Guichenotia*, *Sarotes*, and some *Lasiopetala*, in which one leaf is always larger than the two others, appear to correspond to the leaf with two leaf-like stipules of other *Lasiopetala* and of *Thomasia*. In a few *Lasiopetala* the leaves appear to be really opposite, which is, I believe, the only instance in the whole Order of Sterculiaceæ.

During the ten months which have elapsed since this paper was sent in to the Society, fresh materials have accumulated, which have enabled me to make some slight improvements in the arrangement of a few genera, as well as a few additions, but not so as to interfere with the observations above given. The *Kydia axillaris* of Thwaites, now that the flower is known, proves to be a new genus allied to *Julostyles*, to which must also be referred *K. jujubifolia*, Griff. As Mr. Thwaites did not send any name with his notes, we have given it that of *Dicellostyles*, in allusion to its forked style. A Mauritius specimen, long overlooked among the unnamed ones in the Hookerian herbarium, can only be referred to a new genus, allied on the one hand to *Dombeya* and on the other to *Trochetia*, to which we have given the name of *Cheirolæna*. And amongst Griffith's unnamed specimens we have also a new genus of Durioneæ, allied to *Boschia* and *Neesia*, remarkable for its very small flowers with a depressed circular calyx marked by five cavities at the base of its lobes, with corresponding protuberances outside, and which have suggested the name of *Cœlostegia*. As the part of our 'Genera Plantarum' comprising these Orders is now in the press, it would be superfluous to repeat here the characters of these new genera.

With reference to the observations above given on the homology of the stamens of Buettnerieæ, I would add that Professor Oliver, whose opinions on similar questions must always have great weight, in a paper lately read before the Society, objects to my comparison of the anther of the staminal leaf with the petiolar glands of the leaf properly so called. I freely admit that plausible arguments may be brought forward against my views; but upon a full reconsideration of the subject, I confess myself still further inclined to believe that the explanation I have suggested is likely to prove correct.

I have also to add to my former paper on Tiliaceæ, that, with reference to *Antholoma*, a cursory inspection of specimens during my visit to Paris last autumn, and the examination of a bud and flower kindly sent to me by M. Brongniart, have fully confirmed Dr. Planchon's suggestion that the genus is Tiliaceous—not far from *Elæocarpus*. It is indeed closely allied to *Sloanea*, differing chiefly in the petals united into a tubular, almost conical corolla. I understand that M. Baillon has fully described the plant in a number of his 'Recueil d'Observations' which has not yet reached us.

March 1862.

West African Tropical Orchids.

By Dr. Lindley, F.R.S., F.L.S., &c.

[Read November 7, 1861.]

Most of the plants included in the following succinct enumeration have been obtained in the Expedition to the West Coast of Africa, under the command of Dr. Baikie, R.N. The larger part resulted from the investigation of the late Mr. Barter, a most zealous and skilful collector, who unfortunately fell a victim to his exertions. The remainder have been sent home by Mr. Gustav Mann, who may be fairly pronounced to be second to no one. For the opportunity of examining and describing them, I am indebted to Sir William Hooker.

Till the present time, the species of the Order known to exist in the region over which these collections have extended, were little known; the colony of Sierra Leone having supplied the greater proportion of the 19 previously described. Those now enumerated inhabit the middle and lower course of the Niger River, the country extending from Lagos to the Cameroons, with several from Fernando Po, where, however, *Ansellia africana*, the only species before known from that island, was not seen by Mr. Mann. In all, I have examined 67 species, of which 48 were previously undescribed.

Of those bearing a well-marked resemblance to other portions of the African Flora, the principal part resemble Cape species. These are *Polystachya alpina*, near *P. Ottoniana*; *Penthea Pumilio*, a striking addition to a small Cape genus; *Angræcum arcuatum*, identical with the plant from Albany; and *Cymbidium adenoglossum*, which resembles the *C. tabulare* of Table Mountain.

Others must be compared with Eastern Africa: thus, *Amphorchis occidentalis* is the second species of a genus inhabiting the Isles of France and Bourbon; *Corymbis disticha* is the same as the plant from the same islands; *Calanthe corymbosa* is very near *C. sylvatica* of the Isle of France; *Habenaria prælta* is undistinguishable from the Bourbon species; and *Bolbophyllum lupulinum* has all the appearance of *B. occultum* from the Mauritius and Bourbon, although the structure of the flowers is widely different; finally, there is a new *Notiophrys*, near *N. occulta*, from the same islands. To these special resemblances must be added the generic similarity among many species of *Bolbophyllum*, *Polystachya*, and *Angræcum*, in Eastern and Western Africa: the collections containing 14 species of the first, the same number of the third, and 9 of the second.

Perhaps the most striking geographical fact consists in the presence of the Asiatic *Epipogum nutans* at Ambas Bay, a place a little to the north of the embouchure of the Cameroons River.

It is worthy of remark in conclusion that there is little resemblance between the species now described and those of Abyssinia; there is no *Satyrium*, no *Peristylus*, no *Pterygodium*; and the species of *Habenaria* are quite dissimilar. It is only in the case of *Eulophia guineensis*, the *Saccolabium abyssinicum* of Achille Richard, that the identity of a West African and Abyssinian plant has been ascertained.

LIPARIS, *Richard.*

1. Sp.? in fruit only.
"On Mangroves, R. Nun." (2122) *Barter.*

2. Sp.? no flowers.
"Terrestrial, in a swamp. Flowers deep red. Lagos." (2202) *Barter.*

3. L. GUINEENSIS? *Lindl. in Bot. Reg.* vol. xx. t. 1671.
"Flowers small, purple. Prince's Island." (1980) *Barter.*

The flowers are very young; but the plant would certainly be referred to *L. guineensis* were they green instead of purple.

4. Sp.? no flowers.
"On rocks. Prince's Island." (2029) *Barter.*

BOLBOPHYLLUM, *Thouars.*

§ *Ptiloglossum*; labello elastice articulato, plumoso.

1. B. CALAMARIUM, *Lindl. in Bot. Reg.* 1843, *Misc.* 109; *Bot. Mag.* t. 4088.
"Flowers chocolate. Labellum fringed with long hairs. Town of Nupe." (1482) *Barter.*

2. B. RHIZOPHORÆ; pseudobulbis ovatis diphyllis, foliis oblongis conduplicatis obtusis, spicis multifloris pendulis, bracteis subrotundo-ovatis reflexis margine membranaceis, rachi floribusque scabris, sepalo dorsali lineari lateralibus intus pubescentibus subrotundis cuspidatis multo longiore, petalis linearibus angustissimis glabris apice setaceis, labello lineari intus villoso sub apice mucronulato.
"On Mangroves. Flowers uniform deep purple. R. Nun." (2118) *Barter.*

A very distinct species, with the small flowers and angular filiform rachis covered with a purple rough fur. The bracts are quite smooth.

3. B. DISTANS; pseudobulbis quadrangulis brevibus monophyllis, foliis loratis basi angustatis obtusis spica disticha longioribus, bracteis glumaceis distantibus, sepalis petalisque setaceo-acuminatis, labello a basi concava carinata longissime setaceo villosissimo.
"Epiphyte. Banks of the R. Nun, Sept. 1860." (525) *Mann.*

Leaves about 6 inches long. Scape from 2 to 4 inches long, with about two tight vaginæ. Hairs of the lip apparently violet.

4. B. COCHLEATUM; pseudobulbis angustis teretibus diphyllis, foliis angustis obtusis, scapo plurivaginato paulo breviore, spica densa disticha bracteis cochleatis imbricatis, sepalis carnosis subæqualibus, petalis ovatis carnosis columnæ æqualibus, labello linguiformi supra carinato sepalis breviore, columnæ dentibus erectis obtusis postice emarginatis.
"Epiphyte. Fernando Po, at 4000 feet, Dec. 1860." (643) *Mann.*

The whole inflorescence seems to be purple, and is not unlike that of *Pholidota imbricata.* The lip is unusually small in this section of the genus.

5. B. TENUICAULE; rhizomate filiformi reptante, pseudobulbis distantibus tenuibus diphyllis, foliis linearibus emarginatis, scapo filiformi plurivaginato, spica laxa bracteis glumaceis obtusis haud imbricatis, sepalis petalisque acutis æqualibus, his linearibus acuminatis, labello oblongo concavo obtuso, columna biseta.

"Epiphyte. Fernando Po, at 5000 feet, Dec. 1860." (648) *Mann.*

Much like a small specimen of the next, but differing in the characters assigned to it.

6. B. GRAVIDUM; pseudobulbis ovatis angulatis diphyllis, foliis linearibus acutiusculis, scapo multivaginato longiore, spica oblonga imbricata, bracteis oblongis cymbiformibus, sepalis subæqualibus carnosis canaliculatis acuminatis reflexis, petalis oblongis, labello linguiformi obtuso, columna antice ventricosa appendicibus 2 antice repandis.

"Epiphyte. Fernando Po, at 3000 feet, Dec. 1860." (650) *Mann.*

Resembles *B. cochleatum,* but its spike stands high above the leaves, and the petals and column are quite different; the lip too is larger in proportion.

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7. B. LUPULINUM; pseudobulbis ancipitibus oblongis diphyllis, foliis oblongis obtusis basi angustatis, scapo laxe vaginato pseudobulbo breviore, spica oblonga multiflora bracteis maximis distichis cymbiformibus dense imbricatis nigro furfuraceis, floribus intra bracteas absconditis parce scabridis, sepalis ovatis carnosis, petalis nanis filiformibus, labello oblongo carnoso margine tenui serrato apice calloso obtuso refracto, columna mutica, anthera apice producta incrassata, polliniis 2 connatis.

"Epiphyte. Flowers dark purple. Ambas Bay, Febr. 1861." (783) *Mann.*

In general appearance much like Du Petit Thouars' figure of *Bolbophyllum occultum,* a plant of which I have seen no specimen. They are, however, entirely different in the minute parts of fructification: *B. occultum* having the feathery lip of a Ptiloglot and the two setæ usual in *Bolbophyllum,* while in the species now described the lip is a solid fleshy plate, and the column has no setæ; moreover it has a reflexed white glandular point to the purple lip, an anther with a great fleshy apex, and a pair of oblong connate pollen-masses, all characters at variance with *B. occultum.* It is still more like *B. tetragonum* in structure, though wholly different in habit.

The pseudobulbs are thin, 3 inches long, with an imperfect third edge on one side; and the leaves 9 inches long by 1½ inch wide.

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8. B. ELAIDUM; repens dense cæspitosum, pseudobulbis depressis diphyllis, pedunculo setaceo unifloro foliis lineari-lanceolatis multo longiore, floribus sessilibus bibracteatis, sepalis glabris petalisque minoribus apice setaceis, labello conduplicato lineari obtuso glabro basi dilatato.

"Flowers greenish white. On oil Palms, Brass." (1841, and 73) *Barter.*

There are two unequal diaphanous acuminate bracts beneath each flower, of which the lower is ovate, the upper linear.

9. B. INTERTEXTUM; rhizomate ramosissimo intricato, pseudobulbis ovatis monophyllis, foliis oblongis ovalibusque apiculatis, scapo setaceo multo longiore 2–3-floro, bracteis angustis recurvis ovario longioribus, sepalis membranaceis setaceo-acuminatis, petalis oblongis emarginatis, labello ovato obtuso carnoso sulcato glabro, columna bidentata.

"Epiphyte, green. Banks of the Nun, Sept. 1860." (527) *Mann.*

Much like the last; but the flowers are not solitary, the leaves are not in pairs, the petals are not setaceous, nor is the lip attenuated.

10. B. APETALUM; pseudobulbis angulatis diphyllis foliis æqualibus, scapis setaceis foliis longioribus, spica laxa pauciflora, sepalis carnosis angustis galeatis, petalis obsoletis, labello longo angusto cuneato cucullato scabriusculo apice glabro reflexo carnoso, columna utrinque dilatata carnosa.

"Bagroo River, 1861," *Mann*; and probably "on oil Palms, Brass." (72) *Barter*, without flowers.

This singular little species has flowers like miniatures of *Aconitum Lycoctonum*. For petals there are only two minute rudiments, the lip resembles that of a Polystachya, and the column has two deep fleshy purplish cheeks.

11. B. MICROPETALUM; pseudobulbis angulatis diphyllis foliis linearibus emarginatis obtusis æqualibus, scapo setaceo foliis longiore, spica pauciflora, bracteis brevibus cucullatis, floribus subrotundis, sepalis acutis, petalis setaceis obsoletis, labello cuneato cucullato antice recurvo, columna membranacea brachiis truncatis denticulatis.

"Epiphyte. Fernando Po, at 4000 feet, Dec. 1860." (644) *Mann.*

In general habit like *B. intertextum*; two minute bristles are all that represent petals; the arms of the membranous column are

as if cut off by a knife. The little flowers appear to be yellow. Seems to be related to *Bolbophyllum nutans* of Du Petit Thouars.

12. B. FALCIPETALUM; pseudobulbis ovalibus ancipitibus diphyllis, foliis linearibus emarginatis, scapo longiore scabriusculo ad basin fere florido, bracteis ovatis semiamplexicaulibus refractis, sepalis acutis dorsali latiore, petalis columnæ pedem decurrentibus linearibus falcatis, labello obtuse hastato basi concavo 3-lineato, columnæ angulis incurvis.

"Epiphyte, yellow. Banks of the Nun, Sept. 1860." (526) *Mann.*

The narrow sickle-shaped petals curve forwards over the lip, like a pair of sharp horns.

13. B. PAVIMENTATUM; pseudobulbis densissimis subrotundo-oblongis compressis monophyllis, foliis oblongis planis pedicellatis, scapo foliis longiore filiformi erecto arcte 4-vaginato, spica densa, floribus carnosis glabris bracteis obtusis longioribus, sepalis ovatis acuminatis obtusis, petalis ovatis retusis, labello brevi carnoso tomentoso obtuse acuminato revoluto, columna biseta.

"Epiphyte. Calyx green, corolla purple. Banks of the Nun, Sept. 1860." (519) *Mann.*

The ground is closely paved with the pseudobulbs of this species, which may be compared with such as *cupreum* or *recurvum.*

14. B. COMATUM; pseudobulbis ovatis angulatis monophyllis, foliis papyraceis spathulatis acuminatis, scapo pseudobulbis duplo longiore laxe vaginato, spica oblonga densissima villosissima, sepalis acuminatis, petalis subrhombeis acutis labelloque oblongo obtuso canaliculato scabridis, columnæ brachiis erectis linearibus retusis.

"Epiphyte. Fernando Po, at 2000 feet, Dec. 1860." (642) *Mann.*

A very singular species, little like any other. The heads of flowers are from an inch to 1½ inch long, so entangled with hairs as to resemble a mass of wool.

MEGACLINIUM, *Lindley.*

1. M. OXYPTERUM, *Lindl. in Bot. Reg.* 1839, *Misc.* 10.

"Flowers yellow. Prince's Island." (2026) *Barter.*

The leaf is broader and more oval than in the cultivated plant.

2. M. PURPURATUM; folio solitario oblongo, rachi angusta obtusa cuspidata crenata, bracteis oblongis apiculatis margine revolutis, sepalis aristatis dorsali fornicato, petalis setaceis, labello ovato-lineari basi denticulato.

"Flowers and whole spike purple. Brass." (1854) *Barter.*

CALANTHE, *R. Brown.*

1. C. CORYMBOSA (§ *Eucalanthe B.*); foliis latis 5-nerviis acuminatis basi longe angustatis subtus pilosiusculis, corymbo denso tomentoso, bracteis lineari-lanceolatis ovariis longioribus, labello cuneato bilobo apiculo interjecto apice utrinque truncato dentato basi verrucoso dente parvo porrecto utrinque, calcare filiformi arcuato.

"Herbaceous, 1½ foot high. Corolla white and purple; at 5000 feet, on Fernando Po, Dec. 1860." (392) *Mann.*

An ally of *C. sylvatica* and *natalensis*, from which its dense corymbose inflorescence distinguishes it, exclusive of other important marks. The leaves are 4 inches broad.

POLYSTACHYA, *Hooker.*

1. P. ENSIFOLIA; caule flexuoso compresso, foliis ensiformibus supremo spica simplici longiore, bracteis subulatis, floribus glabris, sepalis lateralibus triangulis carinatis, labello oblongo lævi hastato: lobis basilaribus linearibus acutis nanis.

"Flowers yellow." Prince's Island (1986) *Barter.*

This has much the habit of *Epidendrum armeniacum* (Pöppig's *Encyclia macrostachya*), except that the spike is shorter and thinner. I do not find the usual pulverulent surface upon the face of the labellum.

2. P. BIFIDA; caule stricto gracili, foliis ensiformibus acute bifidis, racemo simplici laxo glabro paucifloro, sepalis obtusis, petalis linearibus, labello sessili carnoso angusto obtuse trifido concavo pulvinare basilari oblongo apice unituberculato.

"Epiphyte, 4000 feet, Fernando Po, Dec. 1860." (649) *Mann.*

This too has the habit of *Epidendrum armeniacum.* From *P. ensifolia* it differs in its much narrower sharply bifid leaves, its loose raceme, blunt sepals, and wholly dissimilar lip, the cushion of which is furnished at the point with a distinct downy tubercle.

3. P. LAXIFLORA; foliis oblongis basi angustatis, panicula patentissima racemosa pubescente, sepalis pubescentibus petalisque linearibus acutis, labello brevi unguiculato lamina rotunda cordata acute tridentata pulvinare lineari secus unguem.

"Epiphyte, a foot high, Fernando Po, June 1860." (437) *Mann.*—"Flowers pale yellow. On Mangroves. R. Nun." (2126) *Barter.*

This is one of the larger species, with spreading panicles of racemose flowers, in which respect it greatly resembles *P. puberula.* Its flowers are more than twice as large, and the lip has a long

narrow unguis, to the middle of which the cushion is confined; the lamina of the lip too is nearly circular, with three short sharp teeth. The fruit is $1\frac{1}{2}''$ long, clavate, with projecting ribs. It flowered in May 1861 in the Royal Botanic Garden, Kew.

4. P. ODORATA; foliis oblongo-lanceolatis membranaceis, spica paniculata pubescente ramulosa, bracteis subulatis, sepalis setaceo-apiculatis, labello cuneato trilobo unguiculato: lobis lateralibus falcatis obtusis intermedio rotundato, ungue carinato farinaceo.

"Flowers white, fragrant." Onitscha. (1483) *Barter*.—Fernando Po, June 1860. (436) *Mann*.

Differs from *P. ramulosa* in its larger downy flowers and in the form of the lip; from *P. puberula* also in the form of the lip; and from both in having a deep keel in the middle of the unguis.

5. P. TESSELLATA; foliis oblongo-lanceolatis pergameneis panicula stricta decomposita glabriuscula gracili ramulosa multo brevioribus, bracteis subulatis, sepalis acutis, labello cuneato unguiculato trilobo: lobis lateralibus falcatis obtusis intermedio subrhombeo emarginato ungue pubescente semicarinato.

"Mouth of the Nun River, left bank, Aug. 1860." (—) *Mann*. Also "from the Cameroons," *Id.*; but no specimen from that locality has been seen by me.

This is much like a very large form of *P. odorata*, and possibly may hereafter prove to be nothing more. It is, however, a much stouter plant, with thicker and blunter leaves, and a tall erect cane-like stem with tier upon tier of fascicles of many-flowered dense spikes; there is little pubescence on the flowers, which are smaller and appear as if tessellated when viewed by transmitted light; the middle lobe of the lip is rather different in form, and the keel in the middle of the unguis is shorter and more undefined.

6. P. PYRAMIDALIS; foliis lanceolatis acuminatissimis, spica composita pyramidali densissima puberula, bracteis cucullatis acutis, sepalis acutis glabriusculis, petalis linearibus, labello cuneato plano sessili obtuso apiculato basi utrinque unidentato tota facie pulverulenta.

"Epiphyte. Calyx and corolla yellow. Banks of the Nun River, Sept. 1860." (522) *Mann*.

A very striking plant, more than $1\frac{1}{2}$ foot high, with flat firm 3–5-ribbed leaves from 4 to 5 inches long. The spikes are short, dense, from 2 to 5 forming a pyramidal inflorescence.

7. P. SETIFERA; foliis oblongis acutis membranaceis supremo elongato spathaceo angustiore, spica subcomposita bracteis setaceis, floribus

pubescentibus, sepalis setaceo-aristatis, labello ovato acuminato membranaceo nudo utrinque unidentato.

"Flowers dull purple." Prince's Island. (1984) *Barter.*

Very distinct in the long setaceous points of the sepals and the thin ovate lip.

8. P.? ALPINA; subacaulis, foliis linearibus obtusis emarginatis, pedunculo hispido unifloro, flore glabro longe pileato, sepalis acutis dorsali concavo, petalis linearibus acutis, labello longe unguiculato rotundato apiculato basi appendice carnoso 6-lobo aucto unguis marginibus inflexis ciliatis.

"Epiphyte, at 6000 feet, Fernando Po, Dec. 1860." (647) *Mann.*

The pollen of this little plant being unknown, it may be doubted whether it belongs to the genus *Polystachya*, especially since it has not the cushion characteristic of all the other certain species, but in its place a remarkably fleshy 6-lobed flat round process. It has, however, the habit of *Polystachya capensis* of Sonder (*P. Ottoniana*, Rchb. f.). I have only seen two specimens, each a few inches high, bearing one dark-red flower, with similarly red carinate bracts.

9. P. ELASTICA; foliis lineari-lanceolatis apice obliquis scapo subæqualibus, spatha membranacea convoluta pedunculo breviore, spica simplici hirta 8–10-flora stricta bracteis cucullatis apiculatis recurvis, floribus glaberrimis longe pileatis, sepalis apiculatis, petalis obovatis, labello elastice resiliente unguiculato mesochilio rhombeo medio pulvinato epichilio incurvo cochleato ungue lineari carina truncata acuta aucto.

"Epiphyte. River Bagroo, April 1861." (902) *Mann.*

Only one specimen of this curious plant has come home. It is 6 inches high, with flowers about ½ inch long, and throws out a large mass of the thin flat roots that are so common among the leafless Angrecs. Its labellum, which is a long narrow yellow body with an inflexed concave terminal lobe, is thrown back with force when the flower expands, so as to hang down over the pileus formed by the united lateral sepals. By what mechanical contrivance this is effected I have been unable to determine.

EULOPHIA, *R. Brown.*

1. E. GUINEENSIS, *Lindl. in Bot. Reg.* t. 686.

"Very ornamental. Flower-stem above 3 ft. high. Sepals chocolate. Labellum light red, with darker lines." Shady rocks; Nupe. (1485) *Barter.*

Much larger in all its parts than the garden plant. It is certain that Achille Richard's *Saccolabium abyssinicum* is the same; the species has therefore an unusually extensive range.

2. E. LURIDA, *Lindl. Gen. et Sp. Orch.* p. 182; *Bot. Reg.* t. 1821.
"Flowers brownish." Brass. (2040) *Barter.*

Exactly the same as the garden plant.

3. E. LONGICOLLIS; foliis . . . , scapo subpaniculato bivaginato, bracteis minimis, pedicellis capillaribus, ovario acuminato, sepalis petalisque lineari-oblongis, labello saccato trilobo calvo laciniis lateralibus semiovatis divaricatis intermedio subrotundo multo brevioribus.
"On *Phœnix spinosa*;" R. Nun. (2121) *Barter.*

Nearly related to *Eulophia lurida*, with a similar pseudobulb clothed with coarse fibres. Scape 6 inches high, with a sheath at the base and a long flattish scale in the middle. Inflorescence as long, with a long narrow membranous bract at the base of each branch. Flowers the size of *E. lurida*. The leaves of this are unknown.

4. E. LUTEA; foliis . . . , scapo 4-vaginato, racemo simplici, bracteis setaceis pedicellorum longitudine, sepalis petalisque linearibus subæqualibus clausis (?), labello trilobo laciniis lateralibus obtusis subdentatis intermedia spathulata tuberculata breviore calcare recto elongato-conico, columna duplo breviore, anthera mutica.
"Flowers yellow. Grassy valleys, Nupe." (1480) *Barter.*

Leaves unknown. Scapes slender, a foot high. Racemes narrow, many-flowered. Flowers the smallest in the genus, apparently pendulous. The tubercles of the middle lobe of the lip are in about three rows; the uppermost are stalked, the lowest gradually change into minute elevations a little below the isthmus.

5. E. VIRILIS; foliis . . . , scapo 3-fido ad basin ramorum vaginato, bracteis setaceis deciduis, sepalis petalisque linearibus obtusis æqualibus, labello trilobo ante ostium bidentato: laciniis lateralibus triangulis intermedio cuneato-rotundato emarginato calcare cylindraceo labello adpresso, columna nana baseos lateribus prominulis pubescentibus.
"Epiphyte. Flowers yellowish red. Ambas Bay, Febr. 1861." (782) *Mann.*

A small-flowered species allied to *E. lutea*, *longicollis*, and *tristis*; the spur, stiff and rising upwards till it becomes parallel with the ascending lip, is remarkable. Pollen-masses not seen.

GALEANDRA, *Lindley.*

1. G. GRACILIS, *Lindl. Gen. & Sp. Orch.* p. 187.—G. extinctoria, *Ib.* "Growing on the ground. R. Bagroo, April 1861." (903) *Mann.*

Exactly like our garden plant. *G. extinctoria* was described from an imperfect specimen, and must be cancelled.

2. [G. LONGIBRACTEATA; scapo valido medio vaginato, racemo laxo multifloro, bracteis linearibus acuminatis ovario æqualibus, sepalis petalisque lanceolatis secundis, labello trilobo basi verrucis 2 oblongis parallelis aucto: laciniis rotundatis lateralibus planis intermedia crispa venis quinque cristatis una parva adjecta utrinque ad isthmum.

Sierra Leone, *Whitfield.*

Leaves unknown. Stem 2 feet high. Near *Galeandra euglossa,* Rchb. f., the lip of which has acute lobes, and neither warts nor crested veins.]

LISSOCHILUS, *R. Br.*

1. L. LONGIFOLIUS, *Bentham in Niger Flora,* p. 530.

"Flowers yellow. Stems 6 feet high, with a spongy creeping rhizome. Swamps, Nupe. (1486) *Barter.* Also Grand Bassa, *Ansell.*

2. L. ROSEUS, *Lindl. in Bot. Reg.* 1843, *Misc.* 37; 1844, t. 12.

"Seven feet high, with pseudobulbous roots. Flowers reddish purple. Base of labellum streaked with orange." Margin of a swampy ravine, Loin Nupe, (1481; also 80 with no locality) *Barter*; side of a rivulet near Pare, (3429) *Id.*

3. L. ARENARIUS; foliis hysteranthiis anguste ensiformibus, scapo gracili laxe vaginato, bracteis setaceo-acuminatis ovario brevioribus, sepalis lanceolatis acutis carinatis reflexis, petalis subrotundis membranaceis, labello subquadrato medio constricto sacco supra basin conico, lamellis 2 cuneatis ad ostium sacci linea elevata interjecta.

"Flowers purple. Base of labellum lined with orange. Flower-stems appear after the first rains, in April; leaves later. Tuber large and flattened." Savannahs in a sandy soil, abundant. (1488) *Barter.*

A noble species, with the stature and appearance of *Bletia verecunda.* Petals full $\frac{3}{4}$ inch long.

4. L. PURPURATUS; foliis hysteranthiis, scapo stricto multifloro, bracteis setaceo-acuminatis ovarii longitudine patentissimis, sepalis oblongis acutis, petalis conformibus obtusis, labelli hypochilio rotundo epichilio angustiore repando undulato calcare brevi conico: lineis 3 tuberculatis lateralibus basi appendiculatis, anthera apiculata.

"Terrestrial; flower-spikes 3 to 4 feet high, appearing before the leaves.

Lip purple, other parts rose-colour. Tubers like kidney potatoes, in chains nearly a yard long; common about Abbeokuta." (3331) *Barter.*

A fine species, readily known by the two great processes standing on either side of the orifice of its little conical spur and terminating the two sides of three glandular lines.

CYMBIDIUM, *Swartz.*

1. C. ADENOGLOSSUM; foliis hysteranthiis, scapi vaginis 3 ventricosis obtusis, racemo paucifloro bracteis angustissimis linearibus, sepalis secundis basi productis cornutis petalisque minoribus lanceolatis acuminatis, labello trilobo medio carnoso striato: lobis lateralibus cuneiformibus intermedio ovato apiculato rugoso per axin serie duplici tuberculatis, columna elongata semitereti, anthera cristata.

"Nupe, 1859," *Barter.*

Nearly related to the Cape *Cymbidium tabulare*, from which its ventricose stem-sheaths and very different lip abundantly distinguish it. The two lamellæ usually found in the axis of the lip of this genus, when strictly limited, are here confluent into a raised striated ridge.

ANGRÆCUM, *Thouars.*

1. A. SUBULATUM, *Lindl. in Comp. Bot. Mag.* ii. 205.

"On Mangroves. R. Nun." (2125) *Barter.*

The leaves are much stouter than in the cultivated plant. Very near the *A. ornithorhynchum* of Brazil.

2. A.? sp.

"R. Nun." Label lost. *Barter.*

A plant with the distichous leaves of some Dendrobium, and small few-flowered axillary spikes. All the flowers fallen.

There is another plant in the collection also without flowers ("On Mangroves, R. Nun," 2106, *Barter*) which seems to belong to this genus. And Mann sends a third, equally indeterminable (Nun, 524).

3. A. PELLUCIDUM, *Lindl. in Bot. Reg.* 1844, t. 2.

"Epiphytal. Flowers yellowish white. Labellum, shining as if frosted. Brass." (37) *Barter.*—"Onitscha," (1757) *Barter*, appears to be the same in fruit.

4. A. VESICATUM, *Lindl. in Bot. Reg.* 1843, *Misc.* 9; folio angusto acuminato inæqualiter bilobo, spica pauciflora vaginis bracteisque membranaceis ochreatis, sepalis ovatis cuspidatis petalisque multo minoribus conformibus carnosis, labello lineari-acuminato convexo calcare incurvo

apice maximo vesicato (columna nana, anthera truncata, polliniis caudiculisque *A. pellucidi*).

"Plant of small growth. Flowers pale yellow. Assaba." (1839) *Barter.*

Flowers very fleshy. The column is short and square, like that of *A. eburneum*; but the pollen-masses and caudicles are those of *A. pellucidum.*

5. A. Tridens; subacaulis, foliis lineari-lanceolatis obtusis apice obliquis, scapo ascendente capillari distanter vaginato, racemo 3–7-floro erecto, bracteis membranaceis cucullatis, sepalis acutis dorsali recurvo, petalis ovatis acuminatis, labello concavo tripartito laciniis filiformibus, calcare pendulo apice vesicato.

"Epiphyte. Fernando Po, 4000 feet, December 1860." (646) *Mann.*

A small species, with the aspect of a lax-flowered Bolbophyll. Caudicles 2, cuneate, downy. Near *A. vesicatum.*

6. A. vagans; foliis oblongo-lanceolatis setaceo-apiculatis, racemis gracilibus multifloris bracteis obsoletis, floribus carnosis, sepalis petalis labelloque conformibus oblongis obtusis, calcare clavato incurvo labello longiore (caudicula lineari didyma).

"Flowers yellow, insignificant. Resembles a gigantic *Vanda*, and covers many of the small islets near the shore. Prince's Island." (1988) *Barter.*

Leaves 8 inches long, 1¾ broad, not very thick. Racemes drooping. The flowers are the size of those of *A. vesicatum*, and very fleshy.

7. A. pertusum, *Lindl. in Comp. Bot. Mag.* ii. 205.

"Flowers white. Brass." (1826) *Barter.*—R. Nun. (—) *Mann.*

The lip of this species varies in being rounded and nearly entire as here, or somewhat acuminate as in the plant first described by me, or truncate and 3-toothed as in what I wrongly distinguished under the name of *A. Pescatoreanum* (Journ. of Hort. Soc. iv. p. 263). In the latter plant the caudicles were certainly not cup-shaped; and therefore I hesitate to adopt Prof. Reichenbach's genus *Listrostachys.* If *Angræcum* is to be broken up, which seems to me quite unadvisable, the structure of the pollen-apparatus must be more exactly ascertained than is possible in dried specimens.

8. A. monodon, *Lindl. in Paxton's Flower Garden,* ii. p. 102. no. 373. ic. xyl. 187.

"Flowers pale yellow, insignificant. Forests between Otta and Abbeokuta, 1859." (3352) *Barter.*

The solitary specimen is very imperfect, but seems to belong to this species.

9. A. ARCUATUM, *Lindl. in Companion to Botanical Magazine*, ii. 204; *Paxton's Fl. Garden*, ii. 120. no. 396. ic. xyl. 199.
"Epiphyte. Calyx and corolla white. Banks of the Nun, Sept. 1860." (521) *Mann.*

This differs in no respect from the South African plant, except in being much more luxuriant.

10. A. CAUDATUM, *Lindl. in Bot. Reg.* t. 1844.
"Brass." (1858) *Barter.*

11. A. DISTICHUM, *Lindl. in Bot. Reg.* t. 1781.
Brass." (1854) *Barter.*—"Onitscha." (1862) *Id.*—"Prince's Island." (1992) *Id.*—Banks of the Nun, Sept. 1860. (523) *Mann.*

12. A. INFUNDIBULARE; caule flexuoso, foliis lanceolatis obtuse et oblique bilobis, pedunculis filiformibus unifloris oppositifoliis, sepalis petalisque linearibus acuminatis, labello subrotundo-oblongo basi infundibulari in calcar incurvum filiforme pedunculo duplo longius producto.
"Flowers large, white, and fragrant. Prince's Island." (2005) *Barter.*

A beautiful species, belonging to the same set as *A. gladiifolium*, which it resembles on a large scale. The lip is about 2¼ inches long and broad; from the tip to the point of the spur it measures 6 inches. The sepals and petals are 2¼ inches long.

13. A. ICHNEUMONEUM; caulescens, foliis distichis late loratis coriaceis apice obliquis, spicis longissimis gracilibus recurvis, bracteis membranaceis cucullatis, floribus distantibus, sepalis petalisque acutis calcare clavato stipitato multo brevioribus, labello lineari concavo truncato tridentato.
"Epiphyte. Calyx and corolla white. Banks of the Nun, Sept. 1860." (520) *Mann.*

A very fine species. Leaves 15 inches long, and 2 broad; spikes of the same length. The flowers when unexpanded look very like some Ichneumon fly settled on the inflorescence. The two pollen-masses have each a long smooth acuminate caudicle; and two small plates stand perpendicular on either side of the orifice of the spur.

14. A.? sp. No flowers.
"Prince's Island." (2019) *Barter.*

A *Vanda*-like plant, not unlike *A. caudatum*, with narrow leaves. The capsules are solitary, clavate, angular, much shorter than the recurved linear canaliculate leaves.

15. A. IMBRICÁTUM; caulescens, foliis coriaceis ovato-oblongis obtusis oblique bilobis, spicis sessilibus densis oblongis multifloris bracteis inferioribus ovatis acutis carinatis imbricatis, floribus carnosis, sepalis petalisque ovatis acutissimis, labello oblongo apiculato cucullato basi infundibulari calcare brevi obtuso uncinato, (caudicula simplici lineari, glandula recurva).

"On trees in dense masses abundant in the lower parts of the river. Flowers white, very fragrant, inconspicuous. On still nights the river resembles a close Orchid-house, in which *Cymbidium sinense* is in flower. Onitscha." (1484) *Barter.*

Leaves about 6 inches long by 1½ broad. Spikes 1½ inch long.

16. A. CAPITATUM; acaule, foliis pergameneis loratis basi canaliculatis apice oblique dentatis, spicis sessilibus capitatis radicalibus, bracteis oblongis membranaceis obtusis, sepalis petalisque oblongo-linearibus obtusis membranaceis, labello concavo obtuso rhombeo margine crenulato calcare pendulo apice inflato ovarii longitudine, (anthera rostrata, caudiculis 2 discretis acuminatis, glandula hippocrepica).

"Flowers pale rose-coloured. Brass." (1857) *Barter.*

The plant out of flower resembles some *Maxillaria*, such as *Baueri*. The capitate inflorescence is very remarkable.

EPIPOGUM, *Gmelin.*

1. E. NUTANS, *Lindl. in Journal of Linnean Society*, i. 177 (Galera nutans, *Blume*).

"Flowers white with purple specks, Ambas Bay, February 1861." (784) *Mann.*

This seems to differ in nothing important from the common Indian form; the two lines of hair on the lip are, however, rudimentary only, and the lip itself is perhaps more fleshy than usual.

VANILLA, *Plumier.*

1. V. AFRICANA; foliis membranaceis anguste ovalibus acuminatis, spicis basi foliosis, labello trilobo infra medium intus carinato cucullato lobis lateralibus rotundatis intermedio ovato acuto ramentis quibusdum ad apicem carinæ.

"On large trees. Brass." (47) *Barter.*

A slender delicate species, formerly cultivated by Loddiges, with whom it flowered in March 1849, when I gave it the present name, under which it was dispersed.

2. V. sp. No flowers.

"Abundant about Angiama." (2134) *Barter.*

I cannot identify the leaves with those of any published species.

3. V. GRANDIFOLIA; folio coriaceo sessili subrotundo-oblongo venis tribus mediis contiguis, spica brevi crassa lignea.

"Epiphyte. Prince's Island." (1981) *Barter.*

Although only a single leaf and flowerless rachis are in the collection, they may be certainly considered evidence of the existence on Prince's Island of a new *Vanilla* of very large size. The leaf is 7 inches long, and 5 inches broad. The remains of the spike are half as long as the leaf, and bore flowers to the base.

NOTIOPHRYS, *Lindl. in Proceedings of Linn. Soc.* vol. i. p. 189.

1. N. GLANDULOSA; foliis ovalibus acutissimis, spica densa bracteis ovatis cucullatis dense glandulosis, floribus glabris, labello obovato cucullato apice lunato recurvo basi ventricoso ubi venæ in furcam apice verrucosam dividuntur.

"Terrestrial. Flowers brownish. Prince's Island." (1952) *Barter.*

This very distinct species exactly agrees with the generic character assigned to the other species. Its habit is quite that of *Goodyera* (Notiophrys) *occulta* of Thouars, but it is a much smaller species.

CORYMBIS, *Thouars.*

1. C. DISTICHA, *Folia Orchidacea sub* Corymbi.

"Herbaceous, 3 to 4 feet high. Flowers white. Fernando Po." (1478) *Barter*; (430) *Mann.*

Prof. Reichenbach ('Bonplandia,' 15 Feb. 1857) has referred to this plant the *Hysteria veratrifolia* of Reinwardt, and *Rhynchanthera paniculata* of Blume's Tabellen, no. 78, the identity of which had been unsuspected in consequence of the erroneous representation of the placenta. Few Orchids have so extensive a range as this, which is found from the Gulf of Guinea to the Feejee Islands, a space of 180 degrees of longitude,—unless, indeed, the genus contains more species than one, as becomes more probable as we acquire better materials. Cuming's plant from the Philippines, for example, seems to be distinct from that of Africa.

PENTHEA, *Lindley.*

1. P. PUMILIO; caule humili laxe vaginato aphyllo 1–2-floro, labello cuneato tridentato, sepalis infra apicem apiculatis petalisque ovalibus obtusis.

"River Bagroo, April 1861." (904) *Mann.*

A very distinct little species, from 2 to 3 inches high. The flowers, which are as large as those of *P. filicornis*, seem to be orange-coloured. There is no trace of leaves.

AMPHORCHIS, *Thouars.*

1. A. OCCIDENTALIS; undique tomentosa, folio unico (variegato) oblongo acuto basi cucullato, scapo bivaginato, spica elongata multiflora, petalis glabris truncatis 2–3-dentatis, labello cuneato apice 3-dentato supra carinato, calcare filiformi subclavato dorsali supra labellum curvato.

"Flowers orange. Leaves marked like *Anæctochilus.* But one specimen seen, in a ravine near Jeba Nupe." (1487) *Barter.*

This species confirms Prof. Blume's opinion (Mus. Lugd. Bot. ii. 190) that the genus *Amphorchis* should be distinguished from *Cynorchis.* Its peculiar character consists in the anther being inverted (not horizontal) as in so many Cape Orchids. The plant now described looks like a tomentose state of *Amphorchis calcarata*, but is totally different in its petals, lip, and spur.

HABENARIA, *W.*

1. H. PALUDOSA; (§ petalis labelloque integerrimis) caule gracili stricto subbifloro folioso, folio infimo lanceolato cucullato superioribus 4 distantibus sensim angustatis setaceo-acuminatis, bracteis cucullatis, sepalis lineari-lanceolatis supremo c. petalis conformibus galeatis, labello lineari-spathulato calcare lineari sepalis longiore, (anthera apiculata basibus loculorum clavatis truncatis breviore, appendice laterali setacea, processibus ovatis, rostello parvo subulato libero).

"Terrestrial. Flowers deep orange. Swamps." Loin Nupe. (1479) *Barter.*

The habit of this is the same as that of *Bonatea pratensis*, to which genus it would be referred, if the genus *Bonatea* could be retained, which is certainly not the case. The stem is from a foot to 14 inches high.

2. H. STENOCHILA; (§ petalis labelloque integerrimis) caule folioso, foliis 5 oblongo-lanceolatis setaceo-acuminatis in bracteis ovario longioribus transeuntibus, spica oblonga multiflora, sepalis lateralibus semiovatis obtusis dorsali petalisque ovato-linearibus multo majoribus, labello lineari, calcare filiformi arcuato ovario duplo longiore apice bidentato, (antheræ basibus angustis ascendentibus, appendice laterali obsoleta, processibus filiformibus elongatis).

"Flowers white, fragrant. Prince's Island." (1995) *Barter.*

Near *H. candida*, but the leaves are broader, the petals and lip very much narrower, and the tip of the spur is not bidentate as in that species.

3. H. MACRANDRA; (§ petalis indivisis, labelli tripartiti laciniis lateralibus setaceis) foliis lanceolatis acutissimis petiolatis caule duplo

brevioribus, vaginis 4 sessilibus lanceolatis inferiore foliacea, racemo laxo 2- plurifloro, bracteis foliaceis acutissimis ovario longioribus, sepalis patentissimis linearibus acuminatis calcare clavato ascendente brevioribus, petalis e lata basi setaceis indivisis, labelli tripartiti laciniis omnibus setaceis, anthera lineari apiculata sepalo dorsali parum breviore.

"Herbaceous plant, 2 feet high; calyx and corolla white and green. Banks of Bonny R., Oct. 1860." (518) *Mann.*

Leaves about 8 inches long, like those of a *Prescottia*. Scape from 7 to 9 inches high, excluding the flowers, which vary in number from two to ten. Sepals rather more than an inch long; spur 3 inches. The whole aspect of the flower is that of a *Bonatea*, without, however, the apparatus of that subgenus. The anther is very nearly as long as the dorsal sepal, a circumstance previously unknown in the genus.

4. H. PRÆALTA, *Lindl. Gen. & Sp. Orch.* p. 321.—Satyrium præaltum, *Thouars, Orch. Afr.* t. 11.

"Top of Clarence Peak, Fernando Po, at 10,000 feet, Dec. 1860." (645) *Mann.*

This does not appear to differ from the Bourbon plant, as far as can be judged from the figure and from a bad specimen given me by the late Achille Richard. One of Mann's two specimens is 2 feet high, the other not quite 5 inches.

Notes on *Coutoubea volubilis*, Mart., and some other Gentianeæ of Tropical America. By Dr. A. H. R. GRISEBACH, F.M.L.S.

[Read Nov. 7, 1861.]

IN the later set of Mr. Wright's Cuba-plants there occurs a twining herbaceous Gentianea, which agrees (though not in all particulars of its description) with *Coutoubea volubilis*, Mart., or at least is its congener, and may be referred to it, till the comparison of authentic specimens shall settle the question whether it be specifically different: the chief discrepancy, viz. a simple raceme, in Dr. von Martius's description may be accidental. From the structure of the flower, however, the 5-partite calyx, and chiefly from the peculiar stigma and singular habit, it is evidently no true *Coutoubea*, but must form a new genus, to which (*Goeppertia*, Nees, in Laurineæ, proving identical with *Aydendron*) I wish to transfer that vacant name, as an acknowledgment due to the deserving Silesian botanist. The systematical place of *Goeppertia* would be next to *Coutoubea*, which in a certain degree it connects with

Erythræa. Its inflorescence is so far interesting, as it tends to show that the true spikes or racemes of *Coutoubea* are to be regarded as composed of cymes, reduced to a single flower, thus passing into the typical cymose inflorescence of *Gentianeæ.*

GOEPPERTIA, nov. gen.

Calyx 5-partitus, 2-bracteolatus. Corolla infundibuliformis, marcescens: limbo 5-partito. Stamina 5, e tubo corollæ exserta: filamentis brevibus infra faucem insertis: antheris erectis oblongis immutatis. Ovarium 1-loculare: stylo deciduo, stigmate indiviso ovoideo, basi in marginem prominulum producto. Capsula 2-valvis, septicida, valvulis paullo introflexis: semina reticulata, marginalia, funiculis dentiformibus inserta. Herba volubilis: folia lanceolata, paribus plerisque distantibus: cymæ 3-fidæ v. 3-chotomæ, in racemum elongatum dispositæ (aut sec. Mart., racemus simplex, terminalis).

G. VOLUBILIS, *Gr.* Syn. *Coutoubea,* Mart. Caulis pluripedalis, tenuis, teretiusculus, superne ramosus, internodiis mediis 3″ longis; folia 1″ longa, 2‴ fere lata, acuminata, basi contracta vaginantia, uninervia, obscure venosa, margine sæpe revoluta; axis inflorescentiæ 6–10″, internodia ejus 1–1½″ longa, cymis pedunculum, calycibus pedicellum, subæquantibus, bracteis bracteolisque linearibus, his brevioribus; calyx bracteolis multo longior; segmentis lanceolatis, acuminatis, apice recurvis, margine membranaceis, tubo corollæ parum superatis; corolla habitu Erythrææ, "ochroleuca" (Mart.), fere ad medium divisa: tubo 2‴ longo, lobis dextrorsum contortis, elliptico-oblongis, obtusis, anthera duplo longioribus; capsula ovoidea, 2‴ longa.

Hab. In Cuba orientali (*Wright,* No. 1372); *C. volubilis* in Haïti (*Bertero*).

Mr. Bentham (Hook. Journ. of Bot. vi. p. 193) has published some emendations to my arrangement of *Gentianeæ,* and, while generally approving of his views, I take this opportunity to add a few observations. In *Coutoubea* Mr. Bentham follows Kunth in regarding *C. spicata,* Aubl., as *C. densiflora,* Mart. Indifferent figures of old authors will often remain doubtful, but in this case I still believe that Martius was quite right in separating his species; for in Aublet's figure the flowers are much more distant, and the leaves not contracted at the base, while in his description I find nothing which would not apply to the plant I have described under his name. Now, as my own *C. spicata* proves to be identical with *C. reflexa,* Benth., of which I now compare specimens from Guiana (R. Schomb. no. 1060) and from Bogota (*C. spicata* in Goudot's Coll.), it is evident that there is no difference in Mr.

Bentham's views on the species to be distinguished, but merely in the interpretation of Aublet's figure. In Lamarck's Illustration there is a confusion between *C. spicata* and *C. ramosa*; for his figure (t. 79) designated *C. alba*, which is a translation of Aublet's French name of his *C. spicata*, belongs to *C. ramosa*, Aubl.; but, bad as it is, this figure was by mistake quoted in the 'Prodromus' under both species.

The genus *Apophragma* I established (as was indeed not advisable) from Aublet's description and figure (t. 26. f. 2, 9, 10), exhibiting exserted stamens and a "stigmate à deux lames larges et aigues:" at the time of its publication I wanted sufficient materials to verify this structure. But as the habit is exactly the same as in the common plant designated *Schübleria tenuifolia*, Don, (Benth. !), and identical with my own specimens of *Apophragma*, Aublet's analysis is probably erroneous: hence Bentham correctly reduced *Apophragma* to *Schübleria*. In his paper there are, however, several errors (partly typographical ones) with regard to Aublet's figures. I had not taken, as he presumed, the characters of *Apophragma* from t. 26. f. 4–7, which belong to *Schultesia*, but from f. 9, 10 (both correctly quoted by Aublet), and the "appendiculate filaments" occur in Aublet's description: f. 1, again, or *Exacum guianense*, is *Schultesia*; f. 2, *E. tenuifolium*, or *Schübleria* (Benth.).

Reichertia was separated by Karsten from *Schultesia* on account of its bidentate filaments: such a structure exists in *Sch. stenophylla* itself, the first-published species of the genus, and is evidently of no generic importance.

Erythræa, *Cicendia*, *Microcala*, *Xestæa*, and *Orthostemon* are mere artificial distinctions. From its twisted anthers, *Erythræa* might be preserved, as it is; though *E. quitensis*, Kth., during anthesis, is devoid of torsion, or shows only a single slight anfractuosity, but it is more or less twisted in the dry state afterwards. The knowledge of the species of *Erythræa*, chiefly of the American ones, is now less satisfactorily settled than at the time of my publication. Its later edition, contained in DeCandolle's 'Prodromus,' the proofs of which could not be corrected by myself, is often obscured by misprints, which may usually be improved by comparison with my monograph and the article on *Gentianeæ* in Hooker's Fl. Bor.-Amer. For instance, there was no *E. tenuifolia*, Gr., in my manuscript, this name belonging, as var. γ, to the preceding *E. linarifolia*, as was to be seen from the form of its diagnosis, though overlooked by subsequent authors. Dr. Schlechtendal (Bot. Zeit. xiii. p. 915) has republished, from a Mexican periodical, Schiede's paper on two Mexican *Erythrææ*, and he describes a third considered as new by Schaffner: of these I possess two collected by Schaffner. His no. 15 (agreeing with *E. divaricata*, Schaffn.) is nothing but a broad-leaved form of the common *E. quitensis*, Kth., a species ranging from the coast of Northern Mexico (Ervendberg, no. 186!) through the mountains of Guatemala (Wendl.!) and Costa Rica (Oerst.!): the original, lower form, with narrower leaves, was collected likewise in Guatemala (Wendl.!), and grows besides in Venezuela (Moritz!) and Quito (Jameson!). In the diagnosis of *E. tetramera*, Schiede, I find nothing which would prevent me from referring it to *E. quitensis*. The second species sent by Schaffner (no. 13), or *E. stricta*, Schiede, agrees with the description of *E. floribunda*, Benth. My *E. Mühlenbergii* was confined by Asa Gray to a species ranging from California to New Mexico, while he reduces the Pennsylvanian plant to the *E. ramosissima*, Pers., which he declares identical with the doubtful *Exacum pulchellum*, Pursh: this is undoubtedly a correct emendation, as Mr. Marsh found the true European species even as far south as Jamaica (probably introduced along the Atlantic with foreign grain). Among the doubtful *Erythrææ*, *E. elodes*, R. S., upon Godron's authority, is *Elodes palustris*; and to *E. Massoni*, Linn. (from an Azoric specimen) may be reduced *E. diffusa*, Woods, which is apparently indeed perennial, as stated by Lejolis, though contradicted by Grenier.

The distinction of the four remaining genera is more questionable, and I should now rather prefer regarding *Microcala* as a section of *Cicendia*; for an intermediate group of species (*Stenocala*) would be formed by *C. exaltata* and by a new Guatemalan species, discovered by Mr. Wendland, as appears from the following review of the genus.

CICENDIA.

Sect. 1. *Hippocentaurea*, Reichenb. Calyx 4–5-partitus.

1. ***C. pusilla*, Gr.** (Syn. ***C. Candollei*, Gr.**)
2. ***C. Poeppigii*, Gr.**
3. ***C. fastigiata*, Gr.**

Sect. 2. *Stenocala*. Calyx ad medium 4-fidus.

4. ***C. exaltata*, Gr.**
5. C. STRICTA, Gr. (n. sp.); caule gracili in pedunculas strictas sæpe unilaterales diviso, foliis inferioribus spathulato-lanceolatis obtusiusculis, superioribus linearibus decrescentibus, calycis lobis ovato-

lanceolatis acutis tubum ovatum æquantibus, corollæ "rubellæ" tubo exserto tenui lobis obovato-oblongis longiore, capsula ovoideo-oblonga, uniloculari: placentis intus non prominulis.

Herba spithamea, annua; folia inferiora 8‴ longa, 2‴ lata, internodiis longiora, superiora distantia, internodiis crescentibus ultrapollicaribus; pedunculi sæpe æquilongi cymam racemiformem a medio caule constituentes; calyx 1½‴, corollæ tubus 3‴ longus; antheræ ovales, incumbentes, paullo exsertæ, filamento tenui; stylus ovario brevior, stigmate late capitato; capsula 3‴ longa.

Hab. In Guatemala, pr. Las Nubes (*Wendl.*, mense Januar.); forma minus elongata in vulcano Frasu, Costaricæ, alt. 9000 ped. (*Wendl.*, m. April.).

Sect. 3. *Microcala*, Lk. Calyx 4-dentatus.

6. *C. filiformis*, Reichenb.
7. *C. quadrangularis*, Gr.

Of *Lisianthus*, sect. *Brachycodon*, Benth., I possess his *L. pumilus*, which proves a congener of *Pagæa*; and probably *L. ramosissimus*, Benth., is *P. Poeppigii* itself. Mr. Bentham observed the anthers to be at length recurved: hence there remain, to distinguish it from *Lisianthus*, the higher insertion of the stamens, the form of the corolla, and the very different habit. In the true *Lisianthi*, the enlargement of the connective on the back of the anther-cells is peculiar; and this character, if compared throughout the genus, may perhaps be of some value in the discrimination of *Pagæa*. In the section *Helia* (viz. in *L. brevifolius* and *L. chelonoides*), the structure of the anthers is the same as in *Chelonanthus* and *Macrocarpæa*: in both species they are at length recurved, and in the former the connective is apiculate: hence the character of *Helia* is chiefly confined to a marcescent corolla, and less peculiar than was supposed. A double placenta in each capsule-cell occurs likewise in *L. chelonoides* (a really annual species, from Kegel's specimens) and in *L. alatus*, Aubl., to which I reduce my *L. Oerstedii*. If this identification proves correct, Aublet's species must be transposed to *Helia*. *L. tetragonus* and *L. auriculatus*, Benth., have been reduced by their author to *L. acutangulus*, Bot. Mag., which is *L. trifidus*, Kth., but not *L. fistulosus*, Poir., the latter, from an authentic specimen, having purple flowers.

The sections *Chelonanthus* and *Macrocarpæa* are to be united, being only distinguished by the shrubby growth of the latter: the shape of the capsule proves of no sectional importance.

My supposition that *Symbolanthus* is little distinguished from the section *Leiothamnus* is confirmed by a beautiful *Lisianthus* collected by Mr. Wendland in Central America, the rosy-violet flowers of which are four or five inches long. The structure of its ovary is the same as in *Lisianthus* (ovarium biloculare, placenta laminata utrinque duplici); but the plant is anomalous in the genus by having the large hypogynous ring of *Tachia*. Except in the larger size of flowers (but not so much as, from a misprint in its description, it would appear), this shrub agrees sufficiently with the figure of *L. calygonus*, R. P., or is at least nearly allied to this and to *L. daturoides*.

Petasostylis is an artificial genus, chiefly distinguished from *Leianthus* by a two-celled capsule. Both species, collected again by Mr. Wendland (*P. saponarioides* in Costa Rica, *P. nigrescens* in Guatemala), are variable in the size of the flowers: the corolla of both is often two inches long, and the lobes (much too long in the figure of Bot. Mag. t. 4043) only 3–4‴, as described by Schlechtendal.

In Eastern Cuba a remarkable new *Lisianthea* was discovered by Mr. Wright (no. 1346), which, though my materials do not allow the dissection of more than two flowers and a single fruit, may be regarded as a link between *Lisianthus*, of which it has the anthers, and *Leianthus umbellatus*, which it approaches by its axillary peduncles and prominulous leaf-sheaths.

ZONANTHUS, nov. gen.

Involucrum calycem cingens, foliolis geminis rotundatis in tubum breviorem connatis, tubo cupuliformi apice intus in marginem annularem integrum productis. Calyx campanulatus, ecarinatus, demum fissilis, 5-lobus, lobis quadrato-subrotundis planis imbricatis margine membranaceis. Corolla hypocraterimorpha, dextrorsum contorta, ad medium fere 5-loba, tubo campanulato, lobis oblongis obtusis. Stamina medio corollæ tubo inserta, filamentis exsertis, antheris incumbenti-recurvis, loculis connectivo dilatato adnatis. Ovarium placentis suturalibus divisis semi-4-loculare, stylo elongato, stigmate 2-lamellato. Capsula septicida, bivalvis, carpidiis 2 introflexis semi-4-locularis, placentis polyspermis marginalibus, testa reticulata. Frutex, foliis spathulato-oblongis petiolatis, petiolis in vaginam annularem connexis; pedunculi axillares, solitarii, folia subæquantes, uniflori; corolla virens.

Z. CUBENSIS, *Gr.* Rami teretiusculi, internodiis brevibus; folia 3–4″ longa, obtusiuscula, arcunervia, in petiola 6–10‴ longa attenuata; pedunculi 3″, calyx 8‴, involucri tubus ei appressus 3–4‴ longus,

lobis ejus patulis calycem subæquantibus; corollæ tubus 9''', lobi 8''' longi, 2-3''' lati; capsula oblongo-lanceolata, glutinoso-nitens, fere sesquipollicaris.

Hab. In montibus S. Cataline Cubæ orientalis.

On *Inocarpus*. By GEORGE BENTHAM, Esq., P.L.S.

[Read Feb. 20, 1862.]

AMONGST the plants sent in 1836 from British Guiana by Sir Robert (then Mr.) Schomburgk were some specimens which, he informed me, were gathered from a most beautiful tree, almost covered with bright-yellow flowers, and called by the natives Etabally, on account of its frequency at the cataracts of that name on the Essequebo. Recognizing in them the general characters of Leguminosæ of the suborder Cæsalpinieæ, but with many differences from all published genera of that group, I described them in Hooker's 'Journal of Botany,' ii. p. 99, as a new genus, under the name of *Etaballia*; and some years afterwards, Dr. Hooker figured it for me in Hooker's 'Icones,' t. 453, 454. At the same time, I found amongst some unnamed specimens from the Isle of St. Vincent's one so closely resembling the *Etaballia* in general foliage, inflorescence, calyx, and petals, that, although I could not then dissect the flowers, I thought I might venture to allude to it as a second species, to which I gave the name of *E. macrophylla*. This, however, proved to be a cultivated specimen of *Inocarpus edulis*; and as that genus had been described with characters totally incompatible with Leguminosæ, and had been referred either to Sapotaceæ or to Hernandieæ, I laid it aside without further examination, vexed at having brought together into one genus plants belonging to such very different orders. Recently, however, Dr. Hooker and myself had occasion to examine *Inocarpus*, of which we have now very complete flowering specimens from the South Pacific Islands, as well as from various tropical botanical gardens; and we found that the received account of the structure of the ovary is in some important respects erroneous, and that the genus is in fact, as it is in appearance, closely allied to *Etaballia*, and must be placed next to it in Leguminosæ, notwithstanding the gamopetalous corolla. The union indeed of the petals at their base, or rather by their claws, is but little more than that which occurs in most Trifoliums, in several Mimoseæ, &c.; the ten monadelphous stamens are such as are frequent in Leguminosæ; and the ovary is characteristic of that order, this being perhaps the only organ by which Leguminosæ can be always recognized through all their

varied modifications. In *Etaballia* it consists of a single carpel with a very short terminal but excentric style, and two or three amphitropous ovules with a superior micropyle attached to the upper or inner angle of the cavity, that is, to the side from which the style proceeds. Only one of these ovules comes to maturity; and in one already faded flower I could find only a single ovule, but of the usual form and attachment, and not anatropous nor pendulous from the summit of the cavity, as described by Endlicher. I do not think, however, that this skilful botanist ever examined *Inocarpus* himself. At the time of the publication of his 'Genera,' it was rare in herbaria; and the statement that the ovule was pendulous from the top of the cavity must have been taken from Roxburgh, the only botanist since Rumphius and Forster who has described the plant from actual specimens; and an inspection of the rude and certainly incorrect analysis in the plate of the Coromandel plants (t. 263) probably induced Endlicher to suppose that the ovule must be anatropous. The conversion of the calyx and corolla into an outer calycule and a simple perianth is another proof that Endlicher's character was compiled from books; for an examination of the plant would have shown him that the two lobes of the calyx are not the summits of two united bracts, but formed by the cohesion of the normal five teeth of the calyx into two or sometimes three lobes, as shown by their venation, and sometimes by minute teeth at the apex.

From these incorrect notions of the structure of the flowers which had obtained, it is not to be expected that the place of *Inocarpus* in the natural system could have been accurately fixed. Jussieu, having only Forster's and Thunberg's characters to judge from, referred it to the "genera *Sapotis* affinia;" and, as far as then known, several technical points appeared to connect it with that order. Endlicher, however, studying apparently Roxburgh's figure, sought to connect it with *Hernandia*, in a small group annexed to Thymeleæ; and there more recent authors have left it, raising however the group to an independent order of Monochlamydeæ, under the name of Hernandiaceæ. Even Miquel, in his 'Flora van Nederlandsch Indië,' adopts this view, extracting his characters from Endlicher, although a slight examination of specimens of the two plants, of which he must have had abundance at his disposal, would have shown him that they differed as widely in most of their essential characters as in habit. In the 'Prodromus,' *Inocarpus* is excluded from Sapotaceæ on the authority of Endlicher; and neither that genus nor *Hernandia* is alluded to under Thymeleæ. All these doubts may now be considered as removed by the reference of *Inocarpus* to Leguminosæ; whilst *Hernandia* remains far away amongst unisexual Monochlamydeæ, allied to those Euphorbiaceæ in which the albumen almost or completely disappears.

The so-called nut, but rather the kernel or seed, of *Inocarpus edulis* appears to be extensively eaten in its native country, and more especially in some of the eastern islands of the Indian Archipelago, where it is said to be very abundant. Rumphius says that, when boiled or roasted in ashes, it is sweet like the Spanish eatable acorns, much prized by the natives of several of the islands, and that in Machian they almost live upon it. According to George Forster, it replaces chestnuts in the Society and Friendly Islands; but is less agreeable, although sweetish, and is ill suited to weak stomachs. Roxburgh, who raised the tree in the Botanic Garden of Calcutta, says that the kernel is certainly eatable, but by no means palatable. Like the *Etaballia*, this tree appears to be hard-wooded and of considerable beauty. The flowers are described as of a pale yellow.

According to Rumphius, the tree yields a resinous glutinous juice, into which the Papuans steep the tips of their arrows, giving them a black colour; and this statement is copied by Forster and subsequent writers. There is some doubt, however, whether Rumphius has not confounded two different trees in his article "Gajanum," Herb. Amboin. i. 170, t. 65, universally referred to *Inocarpus* on the authority of Thunberg. The fruit is indeed so described by Rumphius as to leave little doubt as to its identity, but his representation of the flowers does not at all agree with those of *Inocarpus*. They are figured as borne on long pedicels in a short loose raceme; and the petals are lanceolate, not linear. In all our specimens, wild or cultivated, they are either closely sessile, or the pedicel is so short as to be scarcely perceptible even after the fruit is considerably enlarged, although the stipes of the fruit may then, after the calyx has fallen off, answer the appearance of a pedicel. Forster says indeed that the flowers are "brevissime pedicellati," and that the inflorescence is a raceme, and not a spike; but, in the loose sense in which these words were formerly taken, he may mean that the flowers are distant from each other, and not close together. Forster also describes the flowers as occasionally 6-merous, with twelve stamens; but this must have been accidental. We find them always 5-merous, and Roxburgh so describes them.

With regard to *Etaballia*, there are still some points of affinity and nomenclature to clear up. Dr. Sagot, in his active and scientific explorations of French Guiana, found near Karouany a tree supplying a hard wood, called Boco in the country, and which, from this name and from the station, he concludes to be the *Bocoa provacensis* described and figured by Aublet (Pl. Gui. Supp. 38, t. 391), from specimens without flower or fruit. Dr. Sagot's specimens are in fruit, showing with certainty that they belong to Leguminosæ. He had not seen the flowers; but the foliage and inflorescence, of an unusual description in that order, are so nearly those of *Etaballia*, that he suggested that the two might be at least congeners, if not of one and the same species, and in that case Aublet's older name should be preferred. A further comparison, however, throws some doubt even as to their generic identity. In *Etaballia* the ovary is sessile and very villous, and the funiculus exceedingly short. In *Bocoa* the youngest fruits we have are perfectly glabrous and shortly stipitate; the ovules, even those which are not at all enlarged, are borne on a filiform funiculus at least three times as long as themselves; and as the seed enlarges, this funiculus lengthens in a most remarkable manner, folding itself and coiling backwards and forwards round the outside of the seed, so as almost to enclose it. Until therefore we have seen the flowers of *Bocoa* and the fruit of *Etaballia*, it is most prudent to maintain the two genera as distinct.

Again, as to the name *Etaballia*, Sir R. Schomburgk, in his later expeditions, learned that it was not this tree, but a species of *Vochysia*, which the natives named after the cataract. These errors as to native names are so frequent that their use in botanical nomenclature ought to be restricted to very exceptional cases; but, in the present instance, if *Etaballia* does not merge into *Bocoa*, the rule of priority—one of the most important to maintain in botanical nomenclature—would require the retention of that name, notwithstanding the probability of its original incorrectness.

The following are the technical characters of the three genera, independently of those which are common to all Cæsalpinieæ.

1. Inocarpus. *Forst. Char. Gen.* p. 65, t. 33. Calyx tubuloso-campanulatus, 2- rarius 3-lobus, lobis rotundatis. Petala 5, basi in tubum coalita, supra calycem libera, linearia, subæqualia, imbricata summo intimo, apice corrugato-involuta. Stamina 10, filamentis in tubum corollæ adnatum alte coalitis, alterna longiora; antheræ consimiles,

breves didymæ. Ovarium subsessile. Stylus brevissimus, stigmate oblique dilatato-concavo. Ovula 2–3, rarissime solitaria, amphitropa, subascendentia funiculo brevissimo suturæ appensa. Legumen breviter stipitatum, obovato-incurvum, subdrupaceum. sarcocarpio tenui, endocarpio crasso fibroso, monospermum. Semen late ovatum, funiculo brevissimo turbinato-incrassato affixum. Testa rigide membranacea, reticulato-venosa. Albumen 0. Cotyledones crasso-carnosæ, radicula brevissima supera leviter incurva. "Plumula squamulis minimis imbricatis obtecta."

Arbor excelsa, glabra. Folia simplicia (unifoliolata), brevissime petiolata, ovali-oblonga, penninervia, coriacea. Stipulæ parvæ. Spicæ axillares laxæ. Flores pallide flavi, ad axillas bractearum parvarum sessiles v. subsessiles, bracteolis minutis v. inconspicuis.

Species unica, *I. dulcis*, Forst., in insulis Oceani Pacifici v. Archipelagi Indici spontanea v. culta. Semina edulia. *Gærtn. f. Fruct.* iii. t. 199, et 200. f. 1. *Roxb. Pl. Corom.* iii. t. 263.

2. Etaballia. *Benth. in Hook. Journ. Bot.* ii. 99. Calyx tubulosus, 5-dentatus v. dentibus summis coalitis 4-dentatus. Petala 5, libera v. vix ima basi tubo stamineo coalita, linearia, subæqualia, imbricata summo intimo, apice corrugato-involuta. Stamina 10, hypogyna, alte monadelpha, alterna paullo longiora; antheræ consimiles, breves, didymæ. Ovarium sessile. Stylus cylindricus, stigmate obliquo parum incrassato. Ovula 3–4, amphitropa, funiculis brevissimis appensa. Legumen.......

Arbor pulcherrima, ramis glabris. Folia simplicia (unifoliolata), brevissime petiolata, ovata v. ovato-oblonga, penninervia, coriacea, glabra v. subtus puberula. Stipulæ parvæ. Spicæ axillares v. terminales, densæ, novellæ bracteis imbricatis lupulinæ. Flores flavi, ad axillas bractearum mox deciduarum solitarii, sessiles, bibracteolati. Calyx ferrugineus. Ovarium villosum.

Species unica Guianensis. *Hook. Ic. Pl.* t. 453, 454.

3. Bocoa. *Aubl. Pl. Gui.* t. 391. Calyx tubulosus?, deciduus. Petala... Stamina...... Ovarium breviter stipitatum? ovulis paucis funiculo longo appensis. Legumen (parvum) breviter stipitatum, oblique ovato-subfalcatum, coriaceum, bivalve. Semen unicum, funiculo longissimo filiformi contortuplicato ad hilum turbinato-incrassato semen extus pluries circumdante; albumen 0; cotyledones crassiusculæ; radicula brevissima.

Arbor glaberrima ligno durissimo. Folia simplicia (unifoliolata), breviter petiolata, ovata, penninervia, coriacea, nitida. Stipulæ parvæ v. inconspicuæ. Spicæ ad nodos vetustos solitariæ v. fasciculatæ.

Species unica Guianensis. Flores ignoti. Ovarium jam auctum breviter stipitatum, glaberrimum. Semina in speciminibus immatura.

On the Three remarkable Sexual Forms of *Catasetum tridentatum*, an Orchid in the possession of the Linnean Society. By

Charles Darwin, M.A., F.R.S., F.L.S.

[Read April 3, 1862.]

The President and Officers of the Linnean Society having kindly permitted me to examine the remarkable specimen, preserved in spirits in their collection, of an Orchid bearing flowers of two supposed genera, and known sometimes to bear the flowers of a third genus, I have thought that the Society might like to hear a short account and explanation of this singular case. The following details will hereafter appear in a small work on the 'Fertilization of Orchids by Insect-agency,' which I am preparing for early publication.

Botanists were astonished when Sir R. Schomburgk[*] stated that he had seen three distinct forms, believed to constitute three distinct genera, namely *Catasetum tridentatum*, *Monachanthus viridis*, and *Myanthus barbatus*, all growing on the same plant. Lindley[†] remarked that "such cases shake to the foundation all our ideas of the stability of genera and species." Sir R. Schomburgk affirms that he has seen hundreds of plants of *C. tridentatum* in Essequibo without ever finding one specimen with seeds[‡], but that he was surprised at the gigantic seed-vessels of the *Monachanthus*; and he correctly remarks that here we have traces of sexual difference in Orchideous flowers.

The general appearance of the flower of *Catasetum tridentatum*, in its natural position, is given in the diagram, p. 152 (fig. 1); but the two lower sepals have been cut off. The column is figured separately in an upright position, showing the two curious prolongations of the rostellum, or, as I shall call them, the antennæ.

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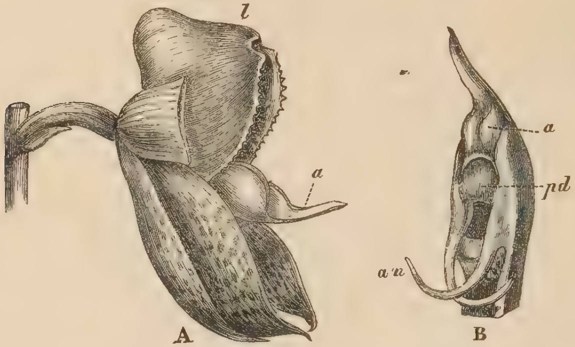
[*] 'Transactions of the Linnean Society,' vol. xvii. p. 522. Another account, by Dr. Lindley, has appeared in the 'Botanical Register,' vol. xxiii. fol. 1951, of a distinct species of *Myanthus* and *Monachanthus* appearing on the same scape: he alludes also to other cases. Some of the flowers were in an intermediate condition, which is not surprising, seeing that in diœcious plants we sometimes have a partial resumption of the characters of both sexes. Mr. Rogers, of River Hill, informs me that he imported from Demerara a *Myanthus*, but that when it flowered a second time it was metamorphosed into a *Catasetum*. Dr. Carpenter ('Comparative Physiology,' fourth edition, p. 633) alludes to an analogous case which occurred at Bristol.

[†] 'The Vegetable Kingdom,' 1853, p. 178.

[‡] Brongniart states (Bull. de la Soc. Bot. de France, 1855, tom. ii. p. 20) that M. Neumann, a skilful fertilizer of Orchids, could never succeed in fertilizing *Catasetum*.

A deep chamber, which from its homological relations must be called the stigmatic chamber, lies between the bases of the antennæ; and the anther, with its concealed pollen-masses, is seated above. My object is not here to describe in detail the structure of the flower and its curious mechanism. But it must be observed that the ovarium is much shorter, thinner, less deeply furrowed, more solid in the centre, and the bract at its base smaller, than in the two succeeding sexual forms presently to be described. The ovarium is bent so that the bucket-like labellum stands uppermost, instead of forming the lower lip as in most Orchids

Fig. 1.



CATASETUM TRIDENTATUM.

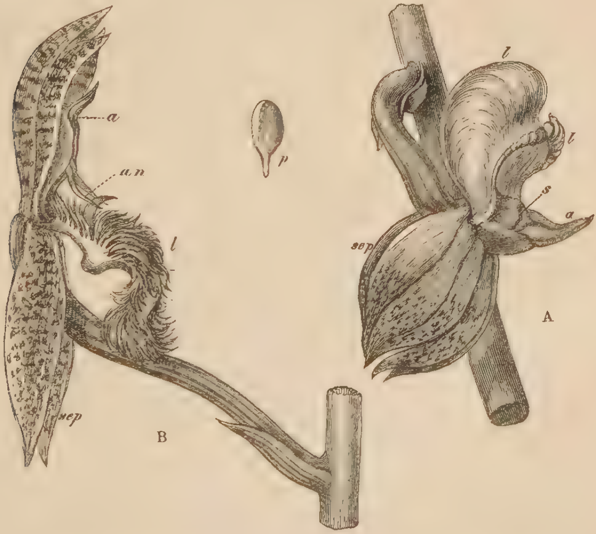
a. anther. *an.* antennæ.
pd. pedicel of pollinium. *l.* labellum.

A. Side view of flower in its natural position with the properly lower sepals cut off.

B. Front view of column, placed upright.

From what I had myself observed previously to reading Sir R. Schomburgk's paper, I was led to examine carefully the female organs of this species, and, I may add, of *C. callosum* and *C. saccatum.* In no case was the stigmatic surface viscid, as it is in all other Orchids (excepting *Cypripedium*), and as is indispensable for securing the pollen-masses on the rupture of the caudicles. I carefully looked to this point in both young and old flowers of *C. tridentatum.* When the surface of the stigmatic chamber and of the stigmatic canal of the above-named three species is scraped off, after having been kept in spirits of wine, it is found to be composed of utriculi (with nuclei of the proper shape), but not nearly so numerous as with ordinary Orchids. The utriculi cohere more together, and are more transparent. I examined for comparison the utriculi of many kinds of Orchids, which had been kept in spirits, and in all found they were much less transparent. Again, in all three species of *Catasetum* the ovule-bearing cords are short, and the ovules present a considerably different appearance, in being thinner, more transparent, and less pulpy than in the numerous other Orchids examined for comparison. They were, however, in not so completely an atrophied condition as in the genus *Acropera*. Although they correspond so closely in general appearance and position with true ovules, perhaps I have no strict right so to designate them, as I was unable in any case to make out the opening of the testa and the included nucleus; nor were the ovules ever inverted. From these several facts—namely, the shortness, thinness, and smoothness of the ovarium, the shortness of the ovule-bearing cords, the state of the ovules themselves, the stigmatic surface not being viscid, the empty condition of the utriculi—and from Sir R. Schomburgk never having seen *C. tridentatum* producing seed in its native home, we may confidently look at this species of *Catasetum*, as well as the other two species, as male plants.

Fig. 2.



MYANTHUS BARBATUS.
a. anther.
an. antennæ.
l. labellum.

MONACHANTHUS VIRIDIS.
p. pollen-mass, rudimentary.
s. stigmatic cleft.
sep. two lower sepals.

A. Side view of *Monachanthus viridis* in its natural position.
(The shading in both drawings has been added from M. Reiss's drawing in the 'Linnean Transactions.')

B. Side view of *Myanthus barbatus* in its natural position.

With respect to *Monachanthus viridis* and *Myanthus barbatus*, these two forms are seen, in the specimen sent home by Sir R. Schomburgk, and preserved in spirits in the Society's collection, to be borne on the same spike. They are represented in the diagrams, page 153. The flower of the *Monachanthus*, like that of the *Catasetum*, grows lower side uppermost. The labellum is not nearly so deep, especially on the sides, and its edges are crenated. The other petals and sepals are all reflexed, and are not so much spotted as in the *Catasetum*. The bract at the base of the ovarium is much larger. The whole column, especially the filament at its summit and the spike-like anther, is much shorter; and the front of the rostellum is much less protuberant. The antennæ or horn-like prolongations of the rostellum are entirely absent. The pollen-masses are rudimentary: I could find no trace of a viscid disk or of a pedicel; if they exist, they must be quite rudimentary, for there is hardly any space for the imbedment of the disk. The absence of the antennæ in this Orchid, which has no pollen-masses to eject, is an interesting fact, as it accords with the view to which I have been led by an examination of three living species of *Catasetum*, namely, that the function of the antennæ is to convey the stimulus of a touch to the medial part of the rostellum, causing the membrane round the disk to rupture, and consequently the liberation and ejection of the pollen-masses. Instead of a large stigmatic chamber, there is a narrow transverse cleft close beneath the small anther. I was able to insert one of the pollen-masses of the male *Catasetum* into this cleft, which, from having been kept in spirits, was lined with coagulated beads of viscid matter and with utriculi. The utriculi, differently from those in *Catasetum*, were charged (after having been kept in spirits) with brown matter. The ovarium is much longer, thicker near the base, and more plainly furrowed than in *Catasetum*; the ovule-bearing cords are also much longer, and the ovules more opake and pulpy, as in all common Orchids. I believe that I saw the opening at the partially inverted end of the testa with a large nucleus projecting; but as the specimens had been kept many years in spirits, and were somewhat altered, I dare not speak positively. From these several facts it is almost certain that *Monachanthus* is a female plant; and Sir R. Schomburgk saw it seeding abundantly. Altogether this flower differs in a most remarkable manner from that of the male *Catasetum tridentatum*, and it is no wonder that they were formerly ranked as distinct genera.

The pollen-masses offer so curious and good an illustration of a structure in a rudimentary condition, that they are worth description; but first I must briefly describe the perfect pollen-masses of the male *Catasetum.* These consist of a large sheet of cemented or waxy pollen-grains, folded over so as to form a sac with an open slit along the lower surface; into this slit cellular tissue enters whilst the pollen is in the course of development in the bud. Within the lower and produced end of each pollen-mass a layer of highly elastic tissue, forming the caudicle, is attached, the other end being attached to the strap-shaped pedicel of the pollinium. The exterior grains of pollen are more angular, have thicker walls, and are yellower than the interior grains. In the early bud the two pollen-masses are enveloped in two conjoined membranous sacs, which are soon penetrated by the two produced ends of the pollen-masses, and by their caudicles; and then the ends of the caudicles adhere to the pedicel. Before the flower expands, the membranous sacs including the pollen-masses open, and leave them resting naked on the back of the rostellum.

In *Monachanthus* the two membranous sacs containing the rudimentary pollen-masses never open; they easily separate from each other and from the anther. The tissue of which they are formed is thick and pulpy. Like most rudimentary parts, they vary greatly in size and in form. The included, and therefore useless, pollen-masses are not one-tenth of the bulk of the pollen-masses of the male: they are flask-shaped, with the lower and produced end greatly exaggerated, and almost penetrating through the exterior or membranous sac. The flask is closed, and there is no fissure along the lower surface. The exterior pollen-grains are square and have thicker walls than the interior grains, just as in the proper male pollen; and what is very curious, each cell has its nucleus. Now R. Brown* states that, in the early stages of the formation of the pollen-grains in ordinary Orchids, a minute areola or nucleus is often visible; so that the rudimentary pollen-grains of the *Monachanthus* apparently have retained (as is so general with rudiments in the animal kingdom) an embryonic character. Lastly, at the base, within the flask of pollen, there is a little sheet of brown elastic tissue—that is, a vestige of a caudicle—which runs far up the produced end of the flask, but does not (at least in some of the specimens) come to the surface, and could not have been attached to any part of the rostellum. These rudimentary caudicles are, therefore, utterly useless.

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* Transactions of the Linnean Society, vol. xvi. p. 711.

We thus see that every single detail of structure of the male pollen-masses, with some parts exaggerated and some parts slightly modified, is represented by these mere rudiments in the female plant. Such cases are familiar to every observer, but can never be examined without renewed interest.

We now come to the third form, *Myanthus barbatus*, often borne on the same plant with the two preceding forms. Its flower, in external appearance, but not in essential structure, is the most different of all. It generally stands in a reversed position, compared with *Catasetum* and *Monachanthus*—that is, with the labellum downwards. The labellum is fringed, in an extraordinary manner, with long papillæ; it has a quite insignificant medial cavity, at the hinder margin of which a curious curved and flattened horn projects. The other petals and sepals are spotted and elongated, with the two lower sepals alone reflexed. The antennæ are not so long as in the male *C. tridentatum*, and they project symmetrically on each side of the horn-like projection at the base of the labellum, with their tips (which are not roughened with papillæ as in the male flower) almost entering the medial cavity. The stigmatic chamber is of nearly intermediate size between that of the male and female forms; it is lined with utriculi, charged with brown matter. The straight and well-furrowed ovarium is nearly twice as long as in *Monachanthus*, but is not so thick where it joins the flower; the ovules are not so numerous as in the female form, but are opake and pulpy after having been kept in spirits, and resemble them in all respects. I believe, but dare not speak positively as in the case of the *Monachanthus*, that I saw the nucleus projecting from the testa. The pollinia are about a quarter of the size of those of the male *Catasetum*, but have a perfectly well developed disk and pedicel. The pollen-masses were lost in the specimens examined by me; but fortunately M. Reiss has given, in the 'Linnean Transactions,' a drawing of them, showing that they are of due proportional size, and have the proper folded or cleft structure; so that there can hardly be a doubt that they are functionally perfect. As we thus see that both the male and female organs are apparently perfect, *Myanthus barbatus* may be considered as the hermaphrodite form of the same species, of which the *Catasetum* is the male, and the *Monachanthus* the female.

It is not a little singular that the hermaphrodite *Myanthus* should resemble in its whole structure much more closely the male forms of two distinct species (namely *C. saccatum* and, more especially, *C. callosum*) than either its own male or female forms.

Finally, the genus *Catasetum* is interesting in an unusual degree in several respects. The separation of the sexes is unknown in other Orchids, excepting probably in the allied genus *Cycnoches* and in one other member of the *Vandeæ*, namely, *Acropera*. In *Catasetum* we have three sexual forms, generally borne on separate plants, but sometimes mingled together; and these three forms are wonderfully different from each other—much more different than, for instance, a peacock is from a peahen. But the appearance of these three forms on the same plant now ceases to be an anomaly, and can no longer be viewed as an unparalleled instance of variability.

Still more interesting is this genus in its mechanism for fertilization. We see a flower patiently waiting, with its antennæ stretched forth in a well-adapted position, ready to give notice whenever an insect puts its head into the cavity of the labellum. The female *Monachanthus*, not having pollinia to eject, is destitute of antennæ. In the male and hermaphrodite forms, namely *Catasetum* and *Myanthus*, the pollinia lie doubled up like a spring, ready to be instantaneously shot forth when the antennæ are touched. The disk end is always projected foremost, and is coated with viscid matter, which quickly sets hard and firmly affixes the hinged pedicel to the insect's body. The insect flies from flower to flower, till at last it visits a female or hermaphrodite plant; it then inserts one of the balls of pollen into the stigmatic cavity. When the insect flies away, the elastic caudicle, made weak enough to yield to the viscidity of the stigmatic surface, breaks, and leaves behind the pollen-mass; then the pollen-tubes slowly protrude, penetrate the stigmatic canal, and the act of fertilization is completed. Who would have been bold enough to surmise that the propagation of a species should have depended on so complex, so apparently artificial, and yet so admirable an arrangement?

Notice of a Collection of Algæ made on the North-West Coast of North America, chiefly at Vancouver's Island, by David Lyall, Esq., M.D., R.N., in the years 1859–61. By W. H. Harvey, M.D., F.R.S. & L.S., Professor of Botany in the University of Dublin, &c.

[Read February 20, 1862.]

Several parcels of Algæ, collected by Dr. David Lyall on the coasts of Vancouver's Island and in the neighbouring seas, and communicated by him to the herbarium at Kew, have been placed in my hands for determination. In the subjoined descriptive catalogue I have given the results of my examination, and shall merely preface the technical matter by a few general observations.

The whole number of species ascertained is 107, of which 100 are marine, and 7 freshwater species. The latter are as follows :—

A Vaucheria (*undeterminable*).
Batrachospermum moniliforme.
Cladophora glomerata.
Conferva rivularis.
Conferva floccosa.
A Zygnema (*undetermined*).
Hydrurus penicillatus.

All of these (including probably the undeterminable ones) are also British, and only one of them, *Hydrurus penicillatus*, is of local distribution. Dr. Lyall's specimens of this plant are of small size; but at Santa Fé, in New Mexico, Mr. Fendler has collected it in great abundance and of gigantic size, his specimens being sometimes two feet in length.

Of the 100 marine Algæ, *eleven* are either new species or well-marked new forms to which I have given specific names, namely these :—

Agarum fimbriatum, *H.*
Laminaria apoda, *H.*
Ectocarpus oviger, *H.*
Rhodomela Lyallii, *H.*
Polysiphonia senticulosa, *H.*
Hymenena latissima, *H.*
Cystoclonium gracilarioïdes, *H.*
Callophyllis flabellulata, *H.*
Prionitis Lyallii, *H.*
Schizymenia coccinea, *H.*
Callithamnion subulatum, *H.*

Of these the most remarkable is *Laminaria apoda*, which differs, as its name imports, from all other species of *Laminaria* in absolutely wanting a stipes. In other species, indeed, the stipes varies from less than half an inch to 12–15 feet in length; but in all cases a more or less obvious stipes interposes between the root and the lamina, and the new portion of frond grows between the apex of the stipes and the base of the lamina. In our *L. apoda* the stipes is represented by a basal callosity or thickening of the lamina, from which a fascicle of fibrous branching roots directly springs. Dr. Lyall has sent numerous specimens of various ages and sizes, and all have precisely similar characters; I do not doubt, therefore, that this is a well-marked and limited form. The nearest approach to *L. apoda* that I have seen occurs in some of the shorter-stemmed varieties of *L. dermatodea*; but I am not possessed of any specimen which could be regarded as intermediate.

I am not so confident of the distinctness of my *Agarum fimbriatum* from *A. pertusum*. The fimbriated character is not a very certain one; for it occurs occasionally in Algæ when developed under unusual circumstances; or it may arise from proliferous growth, after wounding at an early age. More specimens, and specimens of various ages, are required fully to establish this species.

Of *Hymenena latissima* many specimens were collected, but comparatively few of them were of adult age. The younger are undistinguishable from some *Nitophylla* in structure, the generic distinction not generally becoming obvious till fruit begins to be formed. Then the long lines of tetraspores are obviously separated by immersed and anastomosing veins, as in the original *H. fissa*, from which species and from *H. fimbriata* our plant is quite distinct.

Of the other new species, *Callophyllis flabellulata* is remarkable for closely simulating *Euthora cristata*; *Prionitis Lyallii* for its extraordinary variations in ramification and size; and *Callithamnion subulatum* for combining the characters of *C. americanum* and *C. floccosum*.

The species peculiar to the North-west Coast of America are 32, of which 7 are Melanosperms and 25 Rhodosperms, viz.—

Cystophyllum Lepidium, *P. & R.*
Phyllospora Menziesii, *Ag.*
Nereocystis Lütkeanus, *P. & R.*
Alaria marginata, *P. & R.*
Agarum fimbriatum, *H.*
Laminaria apoda, *H.*
Ectocarpus oviger, *H.*

——

Rhodomela Larix, *Ag.*
R. floccosa, *Ag.*
R. Lyallii, *H.*
Polysiphonia Californica, *H.*
P. senticulosa, *H.*
Amphiroa Californica, *Dcne.*
Hymenena fimbriata, *P. & R.*
H. latissima, *H.*
Rhabdonia Coulteri, *H.*
Rhodymenia pertusa, *Ag.*
Cystoclonium gracilarioïdes, *H.*
Callophyllis flabellulata, *H.*
Constantinea Sitchensis, *P. & R.*
Gigartina mollis, *Bail. & Harv.*
Chondrus affinis, *H.*
Endocladia muricata, *Ag.*
Halosaccion Hydrophora, *J. Ag.*
Prionites Lyallii, *H.*
P. lanceolata, *H.*
Schizymenia Mertensiana, *P. & R.*
S. coccinea, *H.*
Microcladia Coulteri, *H.*
M. borealis, *P. & R.*
Ptilota Californica, *P. & R.*
Callithamnion subulatum, *H.*

The following, from among the peculiar North-west American species are "represented" by allied species in other seas, viz.—

Phyllospora Menziesii, by Phyllospora comosa, in Australia.
Alaria marginata, by Alaria esculenta, in Europe.
Rhodomela Larix, by Rhodomela lycopodioïdes, in Europe.
Hymenena fimbriata, by Hymenena fissa, at the Cape of Good Hope.
Rhodymenia pertusa, by Rhodymenia polymorpha, in Australia.

Callophyllis flabellulata, by Callophyllis coccinea, *var.* pusilla, in Australia.
Constantinea Sitchensis, by Constantinea Rosa marina, Kamtskatka.
Chondrus affinis, by Chondrus crispus, in Europe.
Halosaccion Hydrophora, (an *analogous* species to) Gloiosaccion Brownii, in Australia.
Prionitis Lyallii, by Prionitis crinita, in Kamtskatka.
Callithamnion subulatum, by Callithamnion floccosum, in Europe.

The following 43 species are common to the Atlantic Coasts of North America, and those marked with an asterisk are peculiarly American:—

*Fucus furcatus, *Ag.*
F. vesiculosus, *L.*
Desmarestia viridis, *Lx.*
D. aculeata, *Lx.*
*Alaria Pylaii, *Grev.*
Laminaria saccharina, *Ag.*
*L. dermatodea, *De la Pyl.*
L. fascia, *Ag.*
Striaria attenuata, *Grev.*
Chorda lomentaria, *Lgb.*
Ectocarpus siliculosus, *Lgb.*
E. littoralis, *Lgb.*
Odonthalia angustifolia, *Suhr.*
*Chondria atropurpurea, *H.*
Polysiphonia atrorubescens, *Grev.*
P. urceolata, *Grev.*
Corallina officinalis, *L.*
Delesseria Hypoglossum, *Ag.*
D. alata, *Ag.*
Gracilaria confervoïdes, *Grev.*
Plocamium coccineum, *Lyngb.*
Rhodymenia palmata, *Grev.*
Rhodymenia Palmetta, *Grev.*
Ahnfeldtia plicata, *Ag.*
Callophyllis laciniata, *Kg.*
Gigartina mamillosa, *Lx.*
Halymenia ligulata, *Ag.*
Gloiosiphonia capillaris, *Carm.*
Ceramium rubrum, *Ag.*
C. diaphanum, *Ag.*
C. tenuissimum, *Ag.*
Callithamnion polyspermum, *Ag.*
*C. Americanum, *H.*
C. floccosum, *Ag.*
Porphyra vulgaris, *Ag.*
Enteromorpha compressa, *Lk.*
E. intestinalis, *Lk.*
Ulva latissima, *Ag.*
U. Linza, *L.*
Cladophora arcta, *H.*
C. glaucescens, *Griff.*
C. lætevirens, *Kg.*
Hormosira Carmichaëlii, *Kg.*

The following 45 are natives of the British Islands, and generally of the Atlantic Coasts of Europe; those marked with an asterisk have not yet been found on the Atlantic Coast of America:—

Fucus vesiculosus, *L.*
Desmarestia viridis, *Lx.*
D. aculeata, *Lx.*
*D. ligulata, *Lx.*
*Carpomitra Cabreræ, *Kg.*
Laminaria saccharina, *Ag.*
L. fascia, *Ag.*
Striaria attenuata, *Grev.*
Chorda lomentaria, *Lx.*
Ectocarpus littoralis, *Lgb.*
E. siliculosus, *Lgb.*
Polysiphonia atrorubescens, *Grev.*
P. urceolata, *Grev.*
*Laurencia pinnatifida, *Lx.*
Corallina officinalis, *L.*
Delesseria Hypoglossum, *Ag.*
D. alata, *Ag.*
Gracilaria confervoïdes, *Grev.*

Plocamium coccineum, *Lyngb.*
Rhodymenia palmata, *Grev.*
R. Palmetta, *Grev.*
Ahnfeldtia plicata, *Ag.*
Callophyllis laciniata, *Kg.*
*Kallymenia reniformis, *Ag.*
Gigartina mamillosa, *Ag.*
Halymenia ligulata, *Ag.*
*Schizymenia Dubyi, *Ag.*
Gloiosiphonia capillaris, *Carm.*
Ceramium rubrum, *Ag.*
C. diaphanum, *Ag.*
C. tenuissimum, *Ag.*
*Callithamnion Arbuscula, *Lgb.*
Callithamnion polyspermum, *Ag.*
*C. thujoideum, *Ag.*
C. floccosum, *Ag.*
*Codium tomentosum, *Ag.*
Porphyra vulgaris, *Ag.*
Enteromorpha compressa, *Lk.*
E. intestinalis, *Lk.*
Ulva latissima, *Ag.*
U. Linza, *L.*
Cladophora arcta, *H.*
C. glaucescens, *Griff.*
C. lætevirens, *Kg.*
Hormosira Carmichaëlii, *Kg.*

The two following are natives of the Mediterranean Sea, but not of the British Isles nor of the Atlantic Coasts of Europe:—

Amphiroa palmata, *Kg.*
Ulva fasciata, *Del.*

The following 20 are found on the West Coast of South America; those marked with an asterisk are also British:—

*Desmarestia viridis, *Lx.*
Macrocystis pyrifera, *Ag.*
*Laminaria saccharina, *Ag.*
*Chorda lomentaria, *Grev.*
*Ectocarpus siliculosus, *Lyngb.*
Polysiphonia dendroïdea, *Mont.*
*Corallina officinalis, *L.*
*Gracilaria confervoïdes, *Grev.*
*Plocamium coccineum, *Lyngb.*
Rhodymenia corallina, *Bory.*
*Ahnfeldtia plicata, *Ag.*
Callophyllis variegata, *Kg.*
Gigartina radula, *Ag.*
Iridæa cordata, *Bory.*
*Ceramium rubrum, *Ag.*
*C. diaphanum, *Ag.*
*Codium tomentosum, *Ag.*
*Porphyra vulgaris, *Ag.*
*Enteromorpha compressa, *Ag.*
*Ulva latissima, *Ag.*

The following 20 are common to Australia; those marked with an asterisk are also British:—

*Desmarestia ligulata, *Lgb.*
*Carpomitra Cabreræ, *Kg.*
Macrocystis pyrifera, *Ag.*
*Chorda lomentaria, *Grev.*
*Ectocarpus siliculosus, *Lgb.*
*Amphiroa corymbosa, *Lx.*
*Corallina officinalis, *L.*
*Gracilaria confervoïdes, *Grev.*
*Plocamium coccineum, *Lgb.*
Gigartina radula, *Ag.*
*Halymenia ligulata, *Ag.*
Ceramium cancellatum, *Ag.*
*C. rubrum, *Ag.*
*C. diaphanum, *Ag.*
*C. tenuissimum, *Ag.*
*Codium tomentosum, *Ag.*
*Porphyra vulgaris, *Ag.*
*Enteromorpha compressa, *Ag.*
*Ulva latissima, *Ag.*
Ulva rigida, *Ag.*

From the foregoing lists it appears, taking Dr. Lyall's collections for a fair specimen of the marine botany of Vancouver's Island, that, 1st. There are no local species of *Chlorospermeæ.* The few species that were found by Dr. Lyall are all plants of very wide distribution.

2nd. The species of *Melanospermeæ* and *Rhodospermeæ* that are peculiar to the North-west Coast of America amount to about one-third of the whole number collected.

3rd. About one-third of these peculiar species have representatives in other countries; namely, four in Australia, four in Europe, two in North-eastern Asia, and one at the Cape of Good Hope.

4th. Forty-three per cent. of the whole number collected are common to the East Coast of North America, 45 per cent. to the Atlantic Coasts of Europe, 20 per cent. to the West Coast of South America,[*] and 20 per cent. to the Australian shores. This comparison shows that there is greater affinity between the marine vegetation of the Western Coasts of America and of Europe than between the Western and Eastern Coasts of America.

5th. Out of those common to West and East America, all except six are also British; while of those common to West America and to Britain, eight have not yet been recorded from the East Coast of America.

6th. Of those common to South America, three-sevenths are also British; and of those common to Australia, four-fifths are British. But of those species which are common to Britain and either to South America or to Australia, all but one (*Carpomitra Cabreræ*) are so widely diffused that they may be regarded as almost cosmopolitan.

On the whole, the collection does not give evidence of a very extensive marine flora, but rather of a vegetation abounding in species of larger and coarser growth, and deficient in those delicately organized species which frequent shallow bays and estuaries. The most remarkable and characteristic of the Vancouver-Island Algæ are the *Laminariaceæ*, many of which are of such gigantic size that full-grown specimens can hardly be expected ever to be seen in Europe. The *Nereocystis* has a stipes said to attain the length of 300 feet. The *Alariæ* probably have fronds of 20 to 30 feet in length—an enormous size for an undivided lamina of cellular tissue; and the *Costaria* and *Agarum*, though much smaller, still reach dimensions which appear extraordinary when compared with the dwarfer Laminarioid plants of the British shores. The selecting of herbarium specimens, characteristic without being inconveniently large, of such unwieldy objects is no easy task; and Dr. Lyall deserves thanks and praise for the manner in which he has performed it, nor less for the great care with which he has preserved all his specimens, the minute localization of each, and the pains bestowed in furnishing extensive suites of each species. So variable are some of these Algæ in form, that, without examining long suites of specimens of different sizes and ages, it would be difficult or impossible to say what was a species and what a variety. Even with the ample materials supplied to me by Dr. Lyall, I fear that I have not in every case succeeded in unravelling this tangle.

MELANOSPERMEÆ.

1. Fucus vesiculosus, *var.* evesiculosus, *J. Ag. Sp. Alg.* i. 210.
Common between tide-marks. Vancouver's Island; Esquimalt and Victoria Harbours.

A narrower form on the outer sea-coast; a broader within the harbour. Also a very dwarf form from the outer sea-coast, 1–2 inches high, once-forked and fruiting; very similar to the dwarf variety from the Canary Islands, described by Montagne, 'Crypt. Canar.'

2. Fucus furcatus, *Ag.? Ic.* t. 14; *J. Ag. Sp. Alg.* i. p. 209.
Between tide-marks. Esquimalt; Vancouver's Island.

Of Agardh's plant I have seen no authentic specimen. Dr. Lyall's specimens differ from *F. vesiculosus*, var. *evesiculosus*, chiefly in the more immersed, less defined midrib, the uniformly narrower frond, 2–3 lines, rarely 4 lines wide, and the more slender, compressed, not turgid receptacles. My *F. Wrightii*, from Japan, scarcely differs. I fear that neither ought to be regarded as other than local varieties of *F. vesiculosus*, which sometimes, even in Europe, occurs with as narrow fronds. The elder Agardh's figure, above quoted, is worthless as a guide to the species described by J. Agardh.

3. Cystophyllum Lepidium (*Rupr.*). Caule crasso brevi, frondibus elongatis teretibus (crassiusculis) inermibus pinnato-ramosissimis, ramis undique egredientibus geminatis sparsisque basi sæpe foliosis, foliis lineari-lanceolatis enerviis planis acutis, ramulis vesiculiferis subcorymbosis, vesiculis sub apice ramuli indivisi solitariis ovalibus mucronatis, receptaculis .... ?—*Cystoseira Lepidium, Rupr. Alg. Mar. Ochotzk,* p. 155.
On rocks below low-water mark. Entrance of Esquimalt Harbour; also dredged in 14 fathoms at St. Juan Island, 48° 30′ N., 132′ W.

Stem 2–3 inches long. Fronds numerous, closely inserted, 2–3 feet long, 1–1½ line in diameter, in outline of branches lanceolate. Lateral branches 4–6 inches long, in pairs or irregularly scattered, patent, sub-bipinnate; the lower pinnules leaf-bearing, the upper vesiculiferous, each ramulus having a vesicle below its apex. Vesicles 1–1½ line long, like the pods of some *Lepidium.* No fruit on our specimens, which quite agree with those distributed by Dr. Ruprecht, from the Sea of Ochotzk. Though nearly allied to *C. geminatum*, J. Ag., it appears to be distinct.

4. Phyllospora Menziesii, *Ag.*; *Harv.*; *Ner. Bor. Amer.* i. p. 62, t. 3. f. B.

Rocks at low tide, outer sea-coast; Esquimalt and Fuca Strait. *Dr. Lyall & C. Wood.*

5. Desmarestia viridis, *Lamour.*; *Ner. Bor. Amer.* i. p. 77.

Rocks below low-water mark; Esquimalt Harbour and Fuca Strait, *Dr. Lyall*; cast ashore, Esquimalt, *C. Wood*; dredged in 6–8–10 fathoms *Dr. Lyall & C. Wood.*

6. Desmarestia aculeata, *Lamour.*; *Ner. Bor. Amer.* i. p. 78.

Rocks at low water; Esquimalt Harbour, and dredged in 8–10 fathoms, *Dr. Lyall & C. Wood.*

7. Desmarestia ligulata, *Lamour.*; *Ner. Bor. Amer.* i. p. 78.

Rocks below low-water mark; Esquimalt Harbour, *Dr. Lyall & C. Wood*; Burrard's Inlet, Br. Columbia, *C. Wood*; dredged in 10 fathoms in sea water, sp. gr. 1·016, a low sp. gr. caused by admixture of water from the melted snows of the surrounding mountains. Sp. gr. in Straits of Georgia, 1·026, *C. Wood.*

Some of the specimens are of ordinary breadth; others are of the widest variety constituting the *D. herbacea* of authors (*Fucus herbaceus*, *Turn.* t. 99).

8. Carpomitra Cabreræ, *Kütz*; *Harv. Phyc. Brit.* t. 14.

Fuca Strait, *Dr. Lyall.*

A new and unexpected habitat for this local plant. Dr. Lyall's solitary specimen is in fruit, and does not materially differ from British specimens.

9. Macrocystis pyrifera, *Ag.*; *Harv.*; *Ner. Bor. Amer.* i. p. 84.

Fuca Strait and outer sea-coast; Esquimalt, *Dr. Lyall.*

10. Nereocystis Lütkeana, *Post. & Rupr. Illustr.* t. 8, 9; *Ner. Bor. Amer.* i. p. 85.

Rocks at low water; Esquimalt and Fuca Strait, *Dr. Lyall*; dredged in Burrard's Inlet, in 10 fathoms, *C. Wood.*

Besides a large specimen sent in a cask to the Kew Museum, Dr. Lyall has communicated numerous well-dried herbarium specimens of the young plant, which well illustrate the progressive development of the frond. The youngest specimen sent has a stem two inches long, tipped by a bulbous vesicle 2–3 lines in diameter, carrying at its summit two falcate-lanceolate leaves, which show a tendency to split from the base upwards, the line of future separation being indicated nearly to the middle of each leaf. In the next stage the stem has grown but little; but the apical bulb has attained the diameter of 4–5 lines, and the two leaves have, by medial splitting, become four, of which two are perfectly free, and two still connate for a short space near the base—thus showing (as is also more clearly seen in older plants) that the fissure takes place both from the base upwards and from the apex downwards. Other specimens, in which the stem is 6–8 inches long, the bulb 1–1½ inch in diameter, and the leaves 14-16 inches long, are not more advanced in subdivision than the first here described. The age and size at which splitting begins probably depend on the depth at which a specimen grows, those in shallow water beginning to divide at an earlier age. All after-growth consists in the lengthening of the stem till it reaches from 200 to 300 feet, in the increasing size and hollowing out of the apical vesicle till it becomes six feet or more in length, and in the multiplication of leaves, by continual bisection, until there results a huge, geminate tuft of foliage, always separated at base into two distinct bundles by the true apex of the vesicle, from which no leaves spring. Eventually each leaf is 20–30 feet long. In Dr. Lyall's larger herbarium specimens there are eight leaves, each partially bisected.

11. Alaria Pylaii, *Grev.*; *Harv.*; *Ner. Bor. Amer.* i. p. 89.

On stones at the mouth of the Esquimalt Harbour and St. Juan de Fuca, *Dr. Lyall & C. Wood.*

Most of the specimens are immature. The few that produce pinnæ have them broadly obovate, broader in proportion to their length than on specimens from Newfoundland. In other respects the plants agree.

12. Alaria marginata, *Post. & Rupr.*? *Harv.*; *Ner. Bor. Amer.* i. p. 89.
Esquimalt Harbour, &c.

The specimens are immature, without pinnæ, though some are of large size, 5–6 feet long. Even in the youngest state, this differs from the preceding by the very broad midrib, 1–1½ inch wide in fronds where the stipes is 3–4 lines wide; and half-an-inch wide in younger fronds, with stipes two lines wide.

13. Costaria Turneri, *Grev.* (C. Turneri *and* C. Mertensii, *J. Ag. Sp. Algæ*, i. p. 139, 140; *Harv.*; *Ner. Bor. Amer.* i. p. 90.)
Rocks at low water; Fuca Strait and Esquimalt, *Dr. Lyall.*

The numerous and beautifully preserved specimens sent vary with fronds cordate-ovate, ovate, ovato-lanceolate, and lanceolate, these forms passing insensibly one into another. The largest sent by Dr. Lyall are upwards of a foot wide and 2½ feet long, and are frequently perforated toward the base. When full-grown, the fronds measure 10–12 feet in length.

14. **Agarum fimbriatum**, n. sp. Stipite compresso-plano demum fimbriato-pinnato, costa latiore continuato, lamina membranacea bullata hic illic foraminibus irregularibus raris pertusa, basi subcordata, margine crispato eroso-fimbriato.
Dredged in 4–10 fathoms; Esquimalt Harbour, *Dr. Lyall & C. Wood.*

Stipes 1–2 inches long, flattened, 3–4 lines wide, at first simple, afterwards pinnated with horizontally patent, root-like, subulate processes, continued through the frond as an immersed costa, 4–6 lines wide. Fronds 2–3 feet long, 1–1½ wide, cordate at base; the margin strongly curled, and in all the older specimens jagged and fimbriated with irregular excurrent processes. The younger fronds are very much blistered (bullated), but have few foramina. The older are irregularly perforated with holes of unequal size and different shape, more abundant toward the margin. This must be near *A. pertusum*, P. & R., but differs in the fimbriated margin and stipes, if these be constant characters. More specimens are needed to ascertain this point.

15. Laminaria saccharina, *Ag.*; *Harv.*; *Ner. Bor. Amer.* i. p. 92.
Esquimalt Harbour, &c., common, *Dr. Lyall.*

Of this common plant many varieties are sent; some with very broad, others with narrow fronds, both varying greatly in proportionate length to breadth. Some have *strictly ovate* fronds, not more than once and a half as long as broad; others *ovato-lanceolate*, four times as long as broad; and others *lanceolate* and *linear-lanceolate*, many times as long as broad. One has a nearly *orbicular* frond! The substance varies from membranous to coriaceous, and the colour from olive-green to dark brown.

16. Laminaria dermatodea, *De la Pyl.*; *Ner. Bor. Amer.* p. 92.
Fuca Strait and Esquimalt, *Dr. Lyall & C. Wood.*

A series of specimens, young and mature. The younger and uncloven specimens differ from *L. saccharina* in their flattened, widened-upward stipe and less wavy frond; the mature ones from *L. digitata* in the stipe, &c.

17. **Laminaria apoda**, n. s. Stipite nullo!, lamina basi calloso-radicante late cordata coriacea demum apice in lacinias numerosas plus minus fissa v. omnino multipartita, radice ramosissima.

Rocks between tide-marks, Fuca Strait, *Dr. Lyall.*

Frond originating in a callus (or bulbiform stipe) attached to the rocks by many branching fibres, as in other species. Lamina sessile, a foot wide or more, 1-2 feet long (or more ?), cordate at base, ovate or ovato-lanceolate in outline, coriaceous, at first probably undivided, but in all our specimens more or less split, as in *L. digitata.* Some are cleft quite to the base into many narrow segments. A very remarkable species, characterized by the absence of stipe, unless the hardened and thickened base of the lamina be so called. Some specimens of *L. dermatodea* have very short stipites, not more than half an inch long; and such serve to link our present plant with the stipitate species.

18. Laminaria fascia, *Ag.*; *Harv. Ner. Bor. Amer.* i. p. 91.
Esquimalt and Fuca Strait, *Dr. Lyall & C. Wood.*

19. Striaria attenuata, *Grev.*; *Harv. Ner. Bor. Amer.* (*Suppl.*) iii. p. 123.
Orcas Island, Vancouver, *Dr. Lyall.*

20. Chorda lomentaria, *Grev.*; *Harv. Ner. Bor. Amer.* i. p. 98.
In rock-pools, Esquimalt and Fuca Strait, *Dr. Lyall.*

21. **Ectocarpus oviger**, n. sp. Filis (3–5-uncialibus) decomposito-ramosissimis viridibus, ramis ramulisque alternis v. secundis erectis, ultimis longiusculis vagis, sporis ovoideis ad ramos subsessilibus sæpe secundis.

Hab. Stems of *Nereocystis*; Esquimalt, *Dr. Lyall.*

This has the aspect of *E. littoralis*, Ph. Br. (*E. firmus*, J. Ag.), but differs in the fruit, which is abundant in our specimens, and very like that of *E. granulosus*, from which our *E. oviger* differs in ramification.

22. Ectocarpus littoralis, *Ner. Bor. Amer.* i. p. 139.
On rocks and Fuci, Fuca Strait and Esquimalt, *Dr. Lyall & C. Wood.*

23. Ectocarpus siliculosus, *Lyngb.*; *Ner. Bor. Amer.* i. p. 139.
On stems of *Nereocystis*, Esquimalt, *Dr. Lyall.*

24. Ectocarpi sp.
Nanaimo, on rocks, *Dr. Lyall.*

Not in fruit, and overgrown with parasites; may be a var. of *E. littoralis.*

RHODOSPERMEÆ.

25. Rhodomela larix, *Ag.*; *Harv. Ner. Bor. Amer.* ii. p. 24.

On rocks and drifted, Fuca Strait; Point Roberts; Esquimalt; St. Juan de Fuca, *Dr. Lyall & C. Wood.*

26. Rhodomela floccosa, *Ag.*; *Harv. Ner. Bor. Amer.* ii. p. 24.

Fuca Strait and Point Roberts, *Dr. Lyall & C. Wood.*

27. Rhodomela Lyallii, n. sp. Fronde valde compressa elata decomposita pinnata disticha, pinnis pinnulisque in ambitu lanceolatis, ramulis subulatis alternis brevibus, ceramidiis ovatis subsessilibus stichidiisque racemulosis.

Adrift on the beach, Fuca Strait, *Dr. Lyall.*

12–20 inches high, regularly pinnate 3–4 times, all the divisions lanceolate (not corymbulose or fastigiate) in outline; the ramuli of the minor pinnules subequal, the lowest not conspicuously longer than the rest. In fruit, every ramulus of each ultimate plumule is generally converted into either a conceptacle or a stichidium, without any shortening of the rachis; hence the arrangement is racemulose, rather than corymboso-fasciculate, by which character, together with the larger size, more compressed frond, and more regular ramification, this plant differs from *R. floccosa.*

28. Odonthalia angustifolia, *Suhr.*?

On the beach, Esquimalt, *Dr. Lyall.*

29. Chondria atro-purpurea, *Harv. Ner. Bor. Amer.* ii. p. 22, t. 18. E.

Fuca Strait, *Dr. Lyall.*

30. Polysiphonia dendroidea, *Mont. Syllog.* p. 421, No. 1491; *Fl. Boliv.* p. 16, t. 5. f. 1.

Dredged in 10 fathoms, and cast ashore, Esquimalt, *Dr. Lyall.*

Nearly allied to *P. parasitica* and *P. pennata,* but more robust.

31. Polysiphonia atrorubescens, *Grev.*; *Harv. Ner. Bor. Amer.* ii. p. 40; *Ph. Br.* t. 172.

Esquimalt, and Fuca Strait, dredged in 10 fathoms, and cast ashore, *Dr. Lyall.*

Var. β. *minor.* Filis tenuioribus brevioribusque; Orcas Island, *Dr. Lyall.*

32. Polysiphonia Californica, *Harv. Ner. Bor. Amer.* ii. p. 48.

Esquimalt, &c., common, *Dr. Lyall.*

A very abundant species. The herbarium contains upwards of 100 specimens of all sizes, from 1 to 10–12 inches high. The more pinnated specimens pass, by slight changes, into the following. Perhaps all might be united with *P. gemmifera*, P. & R.

33. Polysiphonia Californica, var. β. plumigera. Filis rigidiusculis distanter ramosis, ramis primariis alternis infra longe nudis supra crebre alterne plumuligeris; plumulis bi- tri-pinnatis subfasti-

giatis, pinnulis ultimis flexuoso-alternis subulatis erecto-patentibus; articulis 14–16-siphoniis, ramorum diametro 8–12-plo v. multoties longioribus, ramulorum diametro æqualibus v. vix brevioribus.

Sandy beach near low water, Point Roberts, lat. 49° N., *Dr. Lyall.*

Filaments 5–6 inches long, flaccid, but not softening, sparingly divided into a few, long, naked primary branches, which sometimes have one or two small subulate ramuli below, and are closely set near the apex with bi-pinnate branchlets or plumules. Each plumule is 3-4 lines long and 2–3 broad, with a circumscribed outline. Colour, brown-red. A distinctly marked form, but not specifically different from the common *P. Californica.*

34. Polysiphonia urceolata, *Grev.*; *Harv. Ner. Bor. Amer.* ii. p. 32; *Ph. Br.* t. 167.

Esquimalt; Fuca Strait; Point Roberts: common.

35. POLYSIPHONIA SENTICULOSA, n. sp. Filis 2–3-uncialibus pellucide articulatis capillaribus mollibus cæspitosis siccitate badiis decomposite ramosissimis, ramis alternis secundisve bis terve divisis, secundariis strictis virgatis ramuliferis, ramulis brevibus subuliformibus alternis erecto-patentibus, articulis 4-siphoniis ramorum diametro 4–6-plo longioribus, ramulorum diametro æqualibus v. brevioribus.

Orcas Island, *Dr. Lyall.*

36. Laurencia pinnatifida, *Lamour.*; *Harv. Ner. Bor. Amer.* ii. p. 70; *Ph. Br.* t. 55.

Low-water rocks, St. Juan de Fuca Strait, *C. B. Wood*; Victoria Harbour, *Dr. Lyall.*

37. Amphiroa Californica, *Deane*; *Harv. Ner. Bor. Amer.* ii. p. 86.

Imbedded in roots of *Laminariæ*, Fuca Strait, *Dr. Lyall.*

38. Amphiroæ sp. indeterminata.

St. Juan de Fuca, S.W., *C. Wood*; Esquimalt, *Dr. Lyall.*

39. Amphiroa corymbosa, *Harv. Ner. Austr.* p. 99. t. 38.

Fragments only.

40. AMPHIROA (ARTHROCARDIA) EPIPHLEGNOIDES, *J. Ag. MSS.*, *fide Lenorm.* Fronde dichotoma v. vage ramosa flabelliformi, articulis difformibus, aliis oblongis vix compressis v. teretibus, aliis cuneatis v. polyhedris margine obtusis, ceramidiis paucis articulis latioribus insidentibus.—*A. rudis*, Harv. in Herb. D.C.D.

Rocks near low-water mark, Fuca Strait, *Dr. Lyall.*

3-4 inches long. Lower and some of the upper joints like those of *Corallina officinalis*; the medial generally broad, short, and compressed, triangular or oblate, always rounded at the edge. A native also of Tahiti.

41. CORALLINA OFFICINALIS, *L.*; *Harv. Ner. Bor. Amer.* ii. p. 83.

Rocks between tide-marks, Esquimalt, *Dr. Lyall.*

42. Delesseria hypoglossum, *var.* arborescens, *Lamour.*; *D. arborescens, De la Pyl.*
Fuca Strait, *Dr. Lyall.*

Fine specimens, not unlike some from the North of Ireland, or the "*D. arborescens*" of the French coast.

43. Delesseria alata, *Lamour.*, var. latissima.
On stems of *Nereocystis, Dr. Lyall.*

The fronds, though evidently not fully developed, are of extraordinary width; the broadest $\frac{1}{2}$–$\frac{3}{4}$ inch, the narrower $\frac{1}{4}$ inch wide.

44. Hymenena fimbriata, *P. & R.*; *Harv. Ner. Bor. Amer.* ii. p. 102.
On the beach, Victoria Harbour; Esquimalt, *Dr. Lyall & C. Wood.*

45. HYMENENA LATISSIMA, n. s. Fronde latissima, juniore flabelliformi, adulta vage partita v. laciniata infra venulosa sursum subavenia, laciniis latissime cuneatis v. flabellatis inciso-lobatis, lobulis rotundatis, cystocarpiis sparsis, soris totam frondem demum percurrentibus.
Esquimalt Harbour, dredged and adrift, *Dr. Lyall, C. Wood.*

Fronds 12–15 inches long and wide, variously cleft, the segments fan-shaped, cut at the apex into many, short, round-topped lobes. The lower half of the frond is traversed with many conspicuous, subparallel, anastomosing veins; the upper apparently nerveless, until the tetrasporic fruit is formed, when the interspaces of the sori indicate the lines of nervation; and in older specimens anastomosing nerves may be clearly traced, even to the extremities. Colour, a bright red. The herbarium contains specimens with both kinds of fruit; but the bulk of those sent are without fructification, and consequently not clearly distinguishable from a *Nitophyllum.*

46. Nitophylli? *v.* Hymenenæ species?
Victoria Harbour, in deep water, *Dr. Lyall.*

Specimens without fruit, much torn, and proliferous from the wounds, and therefore not determinable. Some look as if they belonged to *Nitophyllum laceratum*, and others like a divaricated state of *Hymenena.*

47. Gracilaria confervoides, *Grev.*; *Harv. Ner. Bor. Amer.* ii. p. 108.
Esquimalt, *Dr. Lyall.*

A deep-water variety, very much resembling, in ramification and aspects, our *Cystoclonium gracilarioides*, but quite distinct in structure.

48. Rhabdonia Coulteri, *Harv. Ner. Bor. Amer.* ii. p. 154, t. 23. B.
Esquimalt, *C. B. Wood.*

A single specimen, in fruit (*cystocarpia*).

49. Plocamium coccineum, *Lyngb.*; *Harv. Ner. Bor. Amer.* ii. p. 153.
Dredged in 6–8 fathoms, Esquimalt, *Dr. Lyall*; low-water rocks, Fuca Strait, *C. Wood.*

Apparently common; several specimens sent.

50. Rhodymenia pertusa, *J. Ag.*; *Harv. Ner. Bor. Amer.* ii. p. 147.
Cast ashore, Point Roberts; and on rocks at low water, Fuca Strait, *Dr. Lyall.*

Fine specimens; some with *cystocarpia.*

51. Rhodymenia palmata, *Grev.*; *Harv. Ner. Bor. Amer.* ii. p. 148.
On rounded pebbles, on an exposed beach, Esquimalt, *Dr. Lyall.* Also cast ashore, and on rocks at low water, in Fuca Strait, *Dr. Lyall.*

Common, and quite like the ordinary broad-leaved European form.

52. Rhodymenia corallina, *Bory*?
Dredged in 14 fathoms, St. Juan de Fuca, *Dr. Lyall.*

Fragments, apparently of this species.

53. Rhodymenia palmetta, *Grev.*; *Harv. Ner. Bor. Amer.* ii. p. 149.
Fuca Strait, on stones, *Dr. Lyall.*

A single specimen.

54. Ahnfeldtia plicata, *J. Ag.*; *Harv. Ner. Bor. Amer.* ii. p. 168.
Esquimalt, and Fuca Strait, *Dr. Lyall.*

55. Gymnogongri species.
Esquimalt, *Dr. Lyall.*

One small specimen with *favellidia.* It agrees in several respects with *G. linearis* (*Turn. Hist. Fuc.* t. 220), but is much smaller and more ramulous, and may be distinct.

56. CYSTOCLONIUM GRACILARIOIDES, n. sp. Fronde longissima simpliciuscula crassa alterne v. vage v. secunde ramosa, ramis cylindraceis basi vix attenuatis simplicibus omnino nudis v. ramulos perpaucos ferentibus, cystocarpiis?
Dredged in 10 fathoms, Esquimalt Harbour, *Dr. Lyall.*

Fronds 12–18 inches long, 1–1½ lines in diameter; very like the cord-like varieties of *Gracilaria confervoides*, but with the cellular structure proper to *Cystoclonium.* Lateral branches numerous, 5–6 inches long, patent, quite simple, mostly naked, rarely with a few ramuli. Fruit a desideratum.

57. CALLOPHYLLIS FLABELLULATA, n. s. Fronde pusilla (1–4-unciali) flabelliformi coccinea subdichotome v. digitatim multipartita et fastigiata, laciniis linearibus raro cuneiformibus patentibus sensim an-

gustioribus, apicibus acutis, cystocarpiis in discum v. ad marginem laciniarum sessilibus.

Dredged in 8–10 fathoms, and cast ashore, Esquimalt, *Dr. Lyall.*

The smaller specimens so exactly resemble *Euthora cristata*, that it is difficult to persuade oneself, without dissection of frond and fruit, that they belong to a different genus. The larger look like small varieties of *Callophyllis variegata*, and yet are not identical; some very narrow ones are equally like the narrow and dwarf states of *C. coccinea.* The colour is a bright red. The substance is somewhat rigid, but very imperfectly adhering to paper. The average width of the segments is 1–2 lines.

58. Callophyllis variegata, *Kütz. Sp. Alg.* p. 745.

Open beach, Esquimalt, *Dr. Lyall.*

A few small specimens. They are less fastigiate and broader than *C. flabellulata*, with more cuneate and obtuse or truncate segments, and of much softer substance.

59. Callophyllis laciniata, *Kütz.*; *Harv. Ner. Bor. Amer.* ii. p. 171; *Ph. Br.* t. 121.

Esquimalt, *Dr. Lyall.*

Fragments only.

60. Constantinea Sitchensis, *Post. & Rupr.*; *Harv. Ner. Bor. Amer.* ii. p. 173.

Adrift on the beach, Victoria Harbour, *Dr. Lyall.*

Perhaps this is only a luxuriant state of *C. rosa-marina.* The lamina in our specimens is torn, but must have been 6–8 inches in diameter when perfect.

61. Kallymenia reniformis, *J. Ag. Sp. Alg.* ii. p. 286.

Dredged in Esquimalt Harbour, 10 fathoms, *Dr. Lyall.*

A single specimen.

62. Gigartina radula, *J. Ag.*; *Harv. Ner. Bor. Amer.* ii. p. 178.

Fuca Strait and Victoria Harbour, *Dr. Lyall, C. Wood.*

63. Gigartina mamillosa, *J. Ag.*; *Harv. Ner. Bor. Amer.* ii. p. 175.

Var. *α. vulgaris.* Repetite ramosa, laciniis angustis cuneatis linearibusve.

Var. *β. latissima.* Parce dichotoma, laciniis latissime cuneatis truncatis.

Esquimalt Harbour, *Dr. Lyall.*

Between the broadest and simplest and the narrower forms there seems a direct passage; nor can I distinguish such varieties, more than similar states of *Chondrus crispus.* I have seen no authentic specimen of Agardh's "*G. papillata*" (from the Sandwich Islands); but his description agrees well with the broader and simpler of the Esquimalt specimens.

64. Gigartina mollis, *Bail. & Harv.*; *Harv. Ner. Bor. Amer.* ii. p. 175.
Rocks at low water, Fuca Strait, and dredged in 5 fathoms, *Dr. Lyall.*

65. Chondrus affinis, *Harv. Ner. Bor. Amer.* ii. p. 181.
Esquimalt, *Dr. Lyall.*

66. Iridæa cordata, *J. Ag.*; *Turn. Hist.* t. 116; *Ner. Bor. Amer.* ii. p. 180.
Esquimalt and Fuca Strait: common, *Dr. Lyall.*

Many specimens, of various ages, extremely varied in form; some with strictly cordate base, and others gradually passing off toward the obovate basally attenuated form called *I. laminarioides.* Substance in the younger plants thin and glossy, bright purple; in the older thick and fleshy, dull red-brown.

67. Endocladia muricata, *J. Ag.*; *Harv. Ner. Bor. Amer.* ii. p. 182, t. 28. B.
Rocks between tide-marks; Esquimalt, *Dr. Lyall*; in 5–9 fathoms, *C. Wood.*

68. Halymenia ligulata, *J. Ag.*; *Harv. Ner. Bor. Amer.* ii. p. 192.
Esquimalt Harbour, 4–6 fathoms, *Dr. Lyall.*

Two specimens only; a broad, flat, nearly regularly dichotomous form.

69. Halosaccion hydrophora, *Ag.*; *Harv. Ner. Bor. Amer.* ii. p. 194.
Esquimalt, on rocks and in tide-pools, *Dr. Lyall*; on floating wood, *C. Wood.*

Old fronds 10–12 inches long, 1–1½ inch in diameter. Injured specimens are frequently proliferous from the wound, or the broken sac throwing out numerous sacs from the side.

70. **Prionitis Lyallii**, n. sp. Fronde polymorpha membranaceo-coriacea siccitate badia sæpissime plana plus minus pinnatim et dichotome ramosa; nunc subsimplici lanceolata pinnis lanceolatis utrinque marginata; nunc ramosissima, ramis lineari-cuneatis, basi longe angustatis margine foliiferis pinnulatisve, pinnis ciliæformibus; nunc di-pollachotoma laciniis linearibus patentibus apicibus acutis v. explanatis.
Esquimalt, on tidal rocks and rock-pools, *Dr. Lyall*; Fuca Strait, *C. B. Wood.*

Between extreme states of this most variable species nothing but an extensive suite of specimens can suggest a connexion; and yet I find it impossible to fix limits to the following varieties:—

Var. *α. lanceolata.* Fronde 12–14 uncias longa, unciam lata, subsimplici lanceolata, pinnis minoribus foliaceis marginata et e disco prolifera.

Var. *β. ornata.* Caule compresso-filiformi tenui parce ramoso, ramis latissimis 6–8 uncias longis margine et disco foliiferis.

Var. *γ. normalis.* Fronde ramosissima digitato-pinnatim ramosa, ramis majoribus minoribusque lineari-cuneatis, basi angustatis, 2–4 uncias longis, 3–5 lineas latis, plus minus margine pinnulatis, pinnulis subhorizontalibus anguste linearibus v. apice dilatatis.

This seems to be the central or typical form of the species. The larger fronds are 12–14 inches in the expansion of the branches.

Var. δ. *densissima.* Fronde creberrime ramosissima pluries pinnatim ramosa, pinnis pinnulisque linearibus basi angustatis.

A narrower and more densely branched state than the preceding.

Var. ϵ. *intermedia.* Fronde ramosissima angustata, ramis superioribus plus minus dilatatis.

Between δ & ζ.

Var. ζ. *dilatata.* Fronde plus minus ramosa vix pinnulata, ramis superioribus dilatatis foliaceisve lanceolatis.

Var. η. *depauperata.* Parvula, debilis, sæpius di-pollachotoma et fastigiata.

Numerous other minor and connecting states might be named.

71. PRIONITIS LANCEOLATA ? var. FILICINA. Fronde creberrime bi-tripinnata, pinnis pinnulisque horizontalibus.

On rocks, Esquimalt, *Dr. Lyall.*

Two specimens only. In substance, colour, and structure these specimens agree with the Californian *P. lanceolata*, than which, however, they are much more densely branched and more pinnated. I do not venture to propose them as specifically different.

72. Schizymenia Dubyi, *J. Ag.*; *Harv. Ph. Br.* t. 123.

On rounded pebbles, on an exposed beach, Esquimalt, *Dr. Lyall.*

Very similar to some of the larger English specimens.

73. Schizymenia Mertensiana, *P. & R.*? *J. Ag. Sp.* ii. p. 174.

Adrift, Victoria Harbour, *Dr. Lyall.*

A fragment only. The substance resembles parchment.

74. SCHIZYMENIA ? COCCINEA, n. sp. Fronde.................maxima rubro-coccinea gelatinoso-membranacea tenui, siccitate chartæ arcte adhærente, structura laxa, filis medullaribus paucis arachnoideis.

Dredged in 14 fathoms, Griffin Bay, St. Juan Island, *Dr. Lyall.*

Fragments only, from which the outline can be but vaguely guessed at. The largest piece is about 16 inches long and a foot wide, and presents a bright-crimson, glossy, soft membrane closely adherent to paper. Its cellular structure is rather that of *Halymenia*; but the habit is more that of *Schizymenia*, where I provisionally place it.

75. Gloiosiphonia capillaris, *Carm.*; *Harv. Phyc. Bor.* t. 57.

On stems of *Nereocystis*, *Dr. Lyall.*

Two specimens only.

76. Microcladia Coulteri, *Harv. Ner. Bor. Amer.* ii. t. 33. A.
Rocks at low water, Esquimalt, *Dr. Lyall.*

77. Microcladia borealis, *P. & R.*; *Harv. Ner. Bor. Amer.* ii. p. 210.
Rocks at low water, Fuca Strait, *Dr. Lyall.*

78. Ceramium cancellatum, *Ag.*
Rocks and larger Algæ, at low water, Esquimalt, *Dr. Lyall.*

79. Ceramium rubrum, *Ag.*; *Ner. Bor. Amer.* ii. p. 213.
Esquimalt, *Dr. Lyall.*

80. Ceramium diaphanum, *Ag.*; *Ner. Bor. Amer.* ii. p. 215.
Rock-pools, Esquimalt and Port Roberts, *Dr. Lyall.*

81. Ceramium tenuissimum, *Ag.*; *Ner. Bor. Amer.* ii. p. 216. (C. nodosum, *Kütz.*)
Dredged in 10 fathoms, Esquimalt, *Dr. Lyall.*

82. Ptilota Californica, *Rupr.*; *Ner. Bor. Amer.* ii. p. 222.
Esquimalt, *Dr. Lyall.*

Fragments only, much battered.

83. Callithamnion arbuscula, *var.* Pacificum. (C. Pikeanum, *Harv. Ner. Bor. Amer.* ii. p. 230.)
Tidal rocks, Esquimalt, *Dr. Lyall.*

The specimens so nearly coincide with Orkney specimens of the European *C. arbuscula* that I cannot keep them specifically apart. The branching of the ramuli is less pectinate and more regularly pinnate than in the specimen from California on which my "*C. Pikeanum*" was founded.

84. Callithamnion polyspermum, *Ag.*; *Harv. Ner. Bor. Amer.* ii. p. 234.
On rocks, Esquimalt, *Dr. Lyall.*

85. Callithamnion thuyoideum, *Ag.*; *Phyc. Brit.* t. 269.
On dead shells, in 10 fathoms, Esquimalt, *Dr. Lyall.*

There are several specimens of this elegant species, very closely similar to those from the West of Ireland, in Herb. T. C. D. One of Dr. Lyall's shows a tendency to pass into "*C. tripinnatum*" or *C. gracillimum.*

86. Callithamnion Americanum, *Harv. Ner. Bor. Amer.* p. 238, t. 36. A.
On stems of *Nereocystis,* and dredged in 8–10 fathoms, Esquimalt, *Dr. Lyall.*

87. CALLOTHAMNION SUBULATUM, n. sp. Fronde rigidiuscula erecta alterne decomposita ramosissima, ramis ramulisque opposite pinnatis; pinnis subulatis acutissimis, junioribus nudis, adultis basi intus ramulo multifido auctis demum fasciculato-ramulosis; tetrasporis triangule divisis ad ramulos secundarios sessilibus.
On small stones, sandy beach, Esquimalt, *Dr. Lyall.*

More rigid than *C. Americanum,* but seemingly intermediate between the less ramulose states of that species and the following. The larger are 6–8 inches long and broad, their divisions having a pyramidal outline.

88. CALLITHAMNION FLOCCOSUM, var. PACIFICUM. Pinnis omnibus longis filiformi-subulatis simplicissimis.

On stems of larger Algæ, Orcas Island and Esquimalt, *Dr. Lyall.*

Much more densely branched and with much longer pinnæ than the usual Atlantic variety, and with more the aspect of *C. Americanum*; but some Scotch specimens in Herb. T. C. D., by the length of their pinnæ and general habit, come near the present.

CHLOROSPERMEÆ.

89. Codium tomentosum, *Harv. Ner. Bor. Amer.* iii. p. 29.
Esquimalt Harbour, &c., on rocks, *Dr. Lyall.*

90. Porphyra vulgaris, *Ag.*; *Ner. Bor. Amer.* iii. p. 53.
On rocks and Algæ, Esquimalt, &c., common.

Several varieties. Some are 3–4 feet long, and 1 foot wide; others are beautifully marbled with green and purple.

91. Enteromorpha compressa, *Link*; *Harv. Ner. Bor. Amer.* iii. p. 57.
On rocks and dredged, Esquimalt, &c., very common.

92. Enteromorpha intestinalis, *Link*; *Ner. Bor. Amer.* iii. p. 57.
Strait of Georgia, in 8 fathoms, *C. B. Wood.*

93. Ulva latissima, *Linn.*; *Ner. Bor. Amer.* iii. p. 59.
Esquimalt, &c., common.

94. Ulva fasciata, *Del.*; *Ner. Bor. Amer.* iii. p. 58.
Pools between tide-marks, outer sea-coast and adrift, *Dr. Lyall.*

95. Ulva rigida, *Ag.*
Esquimalt, *Dr. Lyall.*

96. Ulva Linzæ, *Ag.*; *Ner. Bor. Amer.* iii. p. 59.
Rock-pools, Esquimalt and Orcas Island, *Dr. Lyall.*

97. Vaucheriæ sp.
In running streams, Esquimalt and Lake Schweltza, *Dr. Lyall.*

The species is not determinable from dried specimens.

98. Batrachospermum moniliforme, *Ag.*
Stones in running streams, Chilukweynk Valley, *Dr. Lyall.*

99. Cladophora arcta, *Phyt. Br.* t. 135; *Ner. Bor. Amer.* iii. p. 75.
Orcas Island, Esquimalt, &c., *Dr. Lyall & C. Wood.*

100. Cladophora glaucescens, *Griff.*; *Ner. Bor. Amer.* iii. p. 77.
Nanaimo, Vancouver's Island, *C. Wood.*

101. Cladophora lætevirens, *Dillw.*; *Ner. Bor. Amer.* iii. p. 82.
Fuca Strait, *Dr. Lyall.*

Young specimens, about an inch in height.

102. Cladophora glomerata, *Linn.*; *Ner. Bor. Amer.* iii. p. 84.
Lake Scheveltza, *Dr. Lyall.*

103. Conferva rivularis, *Ag.*
In running streams, Sumas Prairie, Br. Columbia, *Dr. Lyall.*

104. Conferva floccosa, *Ag.*
In pools above high water, Esquimalt, *Dr. Lyall.*

105. Zygnematis sp.
Pools, Esquimalt.

A moderately robust species, with short joints.

106. Hormotrichum Carmichaelii, *Harv.*; *Ner. Bor. Amer.* iii. p. 90.
Rock-pools between tide-marks, Fuca Strait, *Dr. Lyall.*

107. Hydrurus penicillatus, *Ag.*; *Ner. Bor. Amer.* iii. p. 118.
On stones in streams, Chilukweynk Valley, *Dr. Lyall.*

On the Discovery of *Gladiolus Illyricus* (Koch) in the Isle of Wight. By ALEXANDER G. MORE, F.L.S.

[Read April 3, 1862.]

THROUGH the kindness of my friend the Rev. E. Venables, I have lately obtained the loan of a specimen and drawing of a wild *Gladiolus* gathered by a lady near Shanklin, in the Isle of Wight; and in answer to some inquiries addressed to her, Mrs. Phillipps, the discoverer, has informed me that it was found growing in the midst of a wild tract of copse and heath, called the "Apse" or "America" woods. Only one plant was noticed: it was in bud on the 7th of July 1855, and, having been carried home, afterwards flowered, when the drawing was made.

The *Gladiolus* found at Shanklin evidently belongs to the same species as that which grows in the New Forest, as I have ascertained by comparing Mrs. Phillipps's specimen with a series collected at Lyndhurst, by Mr. John T. Syme; but in the characters afforded by the stigma, whose lobes are suddenly (not gradually) enlarged upwards, the English plant from both localities appears to agree better with *Gladiolus Illyricus* (Koch) than with either *G. imbricatus* (Linn.) or *G. communis* (Linn.); and I therefore venture to propose a change of name, which, I am glad to say, has the approval of my friend Professor Babington, who further allows me to state that he finds the English *Gladiolus* to agree exactly with Continental specimens of *G. Illyricus* issued by C. Billot.

Gladiolus communis (Linn.) is a much larger plant, and is easily distinguished from the other two species by its larger flowers and much stouter leaves. The range also of *G. communis* appears to be more exclusively southern in Europe.

It will be remembered that Dr. Arnott, in the latest edition of the British Flora, treats "*Gladiolus communis*" as an introduced plant. Mr. Bentham, also in his 'Handbook,' writes, "Possibly accidentally introduced;" but I believe that the occurrence of *Gladiolus Illyricus* in the Isle of Wight supplies an important link in support of its being indigenous to Britain.

There can be no doubt as to the identity of the present specimen. Fortunately, the finder noted down the date in her journal at the time, and made a drawing of the plant while it was still fresh. Further, there is a tradition on the spot: it has long been known to the inhabitants of a neighbouring farm-house that a wild *Gladiolus* grows in the woods at Shanklin.

The specimen now exhibited was found in the middle of the wood, in a spot remote from cottages; nor am I aware that *G. Illyricus* is at all cultivated as a garden-flower.

The nature of the British stations (heaths and heathy woods) agrees perfectly with what is known of the place of growth of *G. Illyricus* in the north-west of France.

If *G. Illyricus* appears to belong to the south and west of Europe, its position in Britain is not unlike that of several other species which, though absent from North and Middle Germany, extend along the shores of the Atlantic as far as the British Isles. *Arum Italicum*, *Rubia peregrina*, *Cyperus longus*, *Agrostis setacea*, &c. will readily occur as examples of this; and no doubt all these plants are influenced by the comparative mildness of the maritime climate of the west of Europe.

If very rare in Hampshire and in the Isle of Wight, *G. Illyricus* is also said to be exceedingly scarce in the Loire district of France, as indeed might be expected from its outlying position in both countries, where we may suppose it to be at the extreme limit of its range.

It is hoped that any botanist who may succeed in discovering other plants at Shanklin will not fail to publish the details, since, however great the geographical probabilities of its wildness, it would be very desirable to have more than a single root to vouch for *Gladiolus Illyricus* being indigenous to the Isle of Wight.

Florula Mallica. By M. P. Edgeworth, Esq., F.L.S.

[Read May 1, 1862.]

The paper which I now offer to the Society is the result of my botanical observations in the Multan division of the Punjab, where the Malli resided in the time of Alexander. During an official residence of five years, I have visited every portion of it, but unfortunately not always at the most favourable season for botany; therefore further explorations may add some other species to the somewhat meagre flora now to be described, particularly in the northern portion. It is, however, interesting as a region of botanic geography osculating between that of the North-west of India and that of Sindh and Arabia.

The Multan division, comprising the districts of Jhung, Gogaira, and Multan (15,494 square miles, of which only 1221 are cultivated), is a tolerably natural one as a botanical sub-section. It is triangular, bounded on the south by the Sutlej, on the west by the Jhilum and the Chenab after their junction, except for a short distance, where the boundary is the edge of the Sandy Desert (or Thall) of the Sind Sāgar Doab, on the north-east by an irregular line running from Kot Isa Shah across the Vichan Doab (often termed by us, though not by the inhabitants, the Chaj or Jech) to a little above Chandniot, and thence in a nearly straight line to the Sutlej, nearly opposite Mamdot. It thus embraces some of the detached hills which form the remarkable ranges which shoot up suddenly out of the plain, rising to the height of 1000 feet at Kirana in the Vichan Doab, and finally descend near Shahkot in the Rechnab. Those near Chandniot are about 400 feet, and at Shahkot not about 150. They consist of sandstone and slate, and are very barren.

Thus the division consists of the lower extremities of the three Doab—the Vichan, Rechnab, and Bari. We might include the Bīst also; but the total drying of the old Beas has obliterated that distinction, as obtained in the Ayin Akbari in the 16th century.

Each Doab consists of two distinct portions, the cultivated strip of low land bordering the rivers (Kăchhi) and the central higher land (*Bār*). This word appears to be a corruption of the Arabic *barr*, which is defined by Col. Chesney, in his 'Euphrates,' to be a dry desert of hard clay, more or less covered with bushes and grass. The term was probably applied by the Arab conquerors, who have left traces of their language in the village dialect, in several Arabic words not usually in the Urdū.

The Bār may further be considered as twofold; that more properly so called is raised some thirty to fifty feet above the lower land.

The Bār proper, when seen at the close of a favourable rainy season, is very pleasing—a rich carpet of grass dotted over with bushes or large trees, mostly *Salvadora* or *Tamarix*. The soil is hard, and in a few places there are dunes of blown sand (as in the Thall), and occasionally tracts of sodiferous soil which produces nothing almost but *Salsolaceæ*.

The Bār improper is intersected by the remains of deserted water-courses (arid branches of the several rivers). It is either densely clothed with a jungle of *Jhund* (*Prosopis*) or *Tamarix* both *orientalis* and *Gallica*, or consists of almost perfectly bare open tracts of clay, sometimes sodiferous, causing friable soil, the dust of which will fall like water in drops, sometimes with sand-dunes, generally thinly clothed with the grey *Anabasis multiflora*, which toward the Chenab seldom exceeds two feet in height, while towards the Sutlej it often is five or six, making a small bush with ramifications not unlike a miniature oak, and not unpleasing to the eye when in fruit, when the winged calyces are often of a bright rose-colour.

In the lower part of the Bari Doab, forming the district of Multan, the Bār is intersected by innumerable long, low mounds, the remains of ancient canals from the Ravi, Chenab, and Beyas, which, gradually silting up, have raised themselves above the level of the country, and finally, probably owing to the change of the course of the latter river, been quite deserted. Towards the south of the district there are several ranges of low dunes of drifting sand which have a peculiar vegetation of their own.

The *Kăchhi*, or irrigated portion of the district, produces very fine crops of cereals, sugar-cane, and indigo, particularly on the Chenab. There are also extensive groves of the date-palm, which was introduced by the Arabs in the eighth century. The usual weeds of cultivation appear in the winter, not only those common to the Punjab and North-west Provinces, but from Persia and Affghanistan, that do not cross to the Sutlej, as *Hypecoum* and *Goldbachia*. It is well wooded, principally with *Acacia Arabica* and *Lebek* (the former of enormous size and height) and *Dalbergia Zizyphus*. Wherever irrigation penetrates, the produce is very great; without it, very little will grow. In some places there are only wells for the purpose; but throughout the Kăchhi they have the advantage of inundation-canals from the rivers, which fill their water-courses about the beginning of May, just after the spring crop (Rabi) has been brought in. Consequently the cotton or millet is sown earlier than is the practice where they are dependent only on the rain-fall in June or July.

The climate is excessive, varying from 120° in the shade to 21°, the lowest that I have observed it. During winter, the temperature falls to the freezing-point every night that is clear. There are frequent showers during the season. Hail occasionally falls, principally in March or April. In May the hot winds commence. They blow from the south, instead of west or north-west as is the case in Hindostan. This wind continues more or less during the whole summer. The east wind is rare; but in some years heavy rain accompanies that wind, as in the North-west Provinces: on such occasions the "Bār" is clothed with verdure: but this cannot be depended upon, and for several years in succession there may be no rain-fall at that season; consequently the smaller semitropical annuals which abound in other parts of India are but rare, especially the *Acanthaceæ*.

Water-plants are extraordinarily rare, though there are so many stagnant and semi-stagnant branches of the rivers. I have observed but seven, two of them very rare (*Limnanthemum* and *Nymphæa*), while there is a total absence of the *Lentibulariæ*, *Alismaceæ*, *Naiades*, and *Charæ*, all of which abound in the region immediately to the north and west, so much so that the natives at Multan are unable to clarify their molasses, from the want of the "Jhanjh" or *Hydrilla*, and other *Naiades*, which are used for the purpose of "claying" in other parts of India.

The whole Phanerogamic flora is but 334, exclusive of 113 only cultivated.

There are 34 species riparious, including those which enjoy partial submergence.

There were 32 annual weeds of cultivation in the cold season (Rabi), 33 in the summer and autumn, including those which prevail at all seasons, being 9, 2, and 10 per cent. respectively.

Including all shrubs, trees, and woody climbers, I find but 43, being 13·3 per cent.

I find no less than 78 species peculiar to our deserts. Among these the following are collected by the poorer classes, especially the nomadic tribes who inhabit the "Bār." The women sweep up the fallen seeds by a whisk into straw baskets resembling our dust-pans. *Tribulus alatus*, *Zygophyllum simplex*, *Trianthema*, *Boerhaavia elegans*, *Agrostis scabrifolia*, *Panicum colonum* and *Hydaspicum*, *Cenchrus*, and *Pennisetum*.

It is a curious sight to see the numbers that go out from the villages into the desert to collect and eat the fruit of the *Salvadora oleoides*, called *Pīlū*, and the *Capparis* (*Sodada*) *decidua*.

The late Dr. Stocks kindly communicated to me a list of his Sindh flora: there are only 19 Mallic plants, or 94·3 per cent., not common to Sindh; there are 76, or 77·7 per cent., not observed in the cis-Sutlej States by myself in 1834–8. No less than 227, or nearly 65 per cent., are common to North Africa and Arabia; 83, or nearly 25 per cent., are European, while 73·3 per cent. are common to India proper, exclusive of the Punjab and Sindh. The most remarkable forms were *Pappophorus*, *Stipagrostis*, *Cressa*, *Frankenia*, *Limneum*, *Dipterygium*, and *Neuroda*.

Among the Cryptogamic flora we have but four, exclusive of fungi, *Marsilea*, an *Equisetum*, *Adiantum Capillus-Veneris*, and a *Phascum*. There are a few fungi found, and two of them are edible—one resembling a morel, called *Kumbha*, which is found in profusion in the Rechnab Desert, and which is much liked by the natives and those of my European friends who have had the opportunity of tasting it, which I myself have not. The other is subterraneous, found in cultivated land near Multan, and called *Boenphul*, or earth-fruit, which I do not at all like. Unfortunately my collection of fungi was lost; therefore I cannot enumerate the species.

Lastly, I may point out the paucity of species in this flora—only 338, exclusive of *Cellulares*, in an area exactly the half of Ireland (in which Dr. Mackay enumerates 1057 in his 'Flora Hibernica') —little more than what I collected in Banda, $\frac{1}{5}$th of its area. These species are distributed in 67 orders, exactly five, on an average, in each order; and in 226 genera, giving an average of 1·5 to each genus,—very much less even than remarked upon by Dr. T. Anderson in his 'Aden Florula.' There are very few genera of more than three species. *Eragrostis* has ten; *Aristida*, 9; *Panicum*, 8; *Heliotropium*, 7; and *Corchorus*, 6.

I append descriptions of those species which have not been published, or which call for remark. There are some three or four which I cannot agree in uniting as Dr. Anderson did. My reasons I have given in detail in the notes.

In fine, I beg to offer my thanks for the valuable assistance afforded to me at Kew by our President, Dr. Hooker, Professor Oliver, and Mr. Black.

FLORULA MALLICA.

THALAMIFLORÆ.

RANUNCULACEÆ.

Ranunculus sceleratus, *L.* 776. Not very common.

MENISPERMACEÆ.

Cocculus villosus, *DC. Prodr.* i. 98. Common towards the north, rarer towards the south.

—— Leæba *α*, *DC. P.* i. 99. *α*. A lofty climber: rare.

—— —— *β*. tomentosa. *β*. Prostrate on rocks at Shahkot, &c.

Anamirta Cocculus. *Cultivated.*

NYMPHÆACEÆ.

Nymphæa Lotus *γ*. pubescens, *L.* Rare.

NELUMBIACEÆ.

Nelumbium speciosum, *DC. P.* i. 311. *Cult.*

PAPAVERACEÆ.

Papaver album, *L.* 726. *Cult.*

Argemone Mexicana, *L.* 727. Gradually spreading from the north downwards. It had not reached Multan in 1854.

Hypecoum procumbens, *L.* 180 (*Chiazospermum pendulum*, Bernhardi). The Punjab form has larger leaves than the European and Levant forms. The siliques are sickle-shaped and not pendulous.

Fumaria parviflora. Very abundant.

CRUCIFERÆ.

Farsetia Edgeworthii, *H.f. & T. Linn. Journ.* v. p. 147. Chandniot Hills.

—— Jacquemontii, *H.f. & T. l. c.* p. 148. Most abundant. (Punjabi, *Farid muri.*) Pleasant biting taste: considered a specific for curing rheumatism.

—— Hamiltonii, *Royle.* Principally towards the north-east.

Cochlearia flava (*alyssoides*). River-banks, towards north and east.

Malcolmia Africana, *L.* (*Arabis arvensis*, Edgew. Linn. Trans.). Only to the north.

Sisymbrium Irio, *L.* Fields.

—— irioides, *Boissier.* Fields. Boissier describes *irioides* as larger than *Irio*, whereas this is rather smaller, and as having white petals, whilst those of this are dirty yellow.

—— —— *β*. or nitidum? A much more delicate plant. In the Rechnab Bar or desert, and on the rocks at Chandniot. I should rather refer it to *S. nitidum.*

Lepidium sativum, *L.* *Cult.*

Brassica Rapa, *L.* Extensively cultivated. The roots sliced and dried in the sun.

—— Stocksii, *H.f. & T.* I have only rarely observed this accidentally in fields: not cultivated.

—— Eruca, *L.* Much cultivated for its oil.

—— (*Sinapis*) campestris, *L.* *Cult.* "*Sarson.*"

—— juncea, *L.* *Cult.* "*Rai.*" These native names have been accidentally transposed in the paper in the Linn. Journ. v. pp. 169, 170.

Goldbachia lævigata, *DC.* Corn-fields, only towards the north-west.

Dipterygium glaucum, *Dcn. Fl. Sinaica.* Sand-hills to the south.

Raphanus sativus, *L.* *Cult.* The siliques boiled as a pot-herb—not the root.

RESEDACEÆ.

Oligomeris glaucescens, *Dcn. Jacqt.* t. 25 (*Reseda oligandra,* J. A. S. vii. p. 764).

CAPPARIDEÆ.

Capparis spinosa (*obovata,* Royle), *Jacqt.* t. 21. I find no description of the dehiscence of the fruit in any European Flora. It is noted by Decaisne in Jacquemont. When ripe the skin separates and curls up in three or four segments like a *Martagon,* showing the seeds immersed in crimson pulp. It is found abundantly at Multan, but not in the next region northward, and appears again in the confined valleys of the Sutluj, Beyas, &c., as far as the Indus at Iskardo. The fruit is pickled by the natives. I preserved the buds in the European style and found them first-rate.

—— decidua (*Sodada,* Forsk.) (*aphylla,* Roxb.). Most abundant: much used for firing, as it burns with a gaseous flame. The largest individual I have observed was near Chichawatni, at Jhangbiabani, 8 feet in girth.

Cratæva Roxburghii. *Gardens.*

Cadaba Indica. Rocks at Chandniot.

Cleome papillosa (*C. gracilis,* Edgew. J. A. S.).

—— brachycarpa, *DC.* (*C. Ruta,* Dcn. in Jacquemont, t. 19).

Polanisia viscosa. Fields.

Gynandropsis pentaphylla. Fields, and in the desert. Eaten as a vegetable. (*Gandhūli,* Ind.)

POLYGALACEÆ.

Polygala (Blepharidium) erioptera, *DC.*—See note, p. 199.

ELATINACEÆ.

Lancretia æstivosa, *W. A.* The flowers are as often twin as solitary. The carpels are very often destroyed by a small Cerambyx.

Bergia ammannioides.

CARYOPHYLLACEÆ.

Vaccaria parviflora. Corn-fields.
Silene conoidea. Ditto.
Stellaria media. Ditto.
Stipularia flaccida, *Roxb.* This differs not only in its decandrous flowers, but in the seed, which is broadly winged. In *pentandra* the seed is scrobiculate and scarcely winged, while in *fallax* the seed is a compressed sphere without any wing.
Spergularia rubra. Fields.
Polycarpæa corymbosa. Fields.

PORTULACACEÆ.

Portulaca meridiana. Gardens and desert.
—— quadrifida. Ditto ditto.
—— oleracea. Cultivated as a vegetable.

MOLLUGINEÆ.

Mollugo Cerviana. Fields and desert.
—— nudicaulis. Ditto ditto.
Orygia trianthemoides. Chandniot, &c.
Glinus lotoides. Desert.

FRANKENIACEÆ.

Frankenia pulverulenta. In sodiferous soil, but rare.

MALVACEÆ.

Abutilon Indicum. (Ind. *Abut kanda.*) Used in coughs.
Sida cordifolia.
—— grewioides, *Guil. & Per. Fl. Seneg.* 71. This differs from the African form in the petioles being longer, and the pedicels ½ to 1 inch long, not *subsessile* as described. The carpels are rugose on the back and shortly beaked.
—— humilis.
Malva vulgaris.
—— parviflora.
Althæa Ludwigii.
Hibiscus micranthus, *Linn.* Chandniot hills.
—— laguneoides. In cotton-fields.—See description, p. 199.
Abelmoschus esculentus.
Gossypium herbaceum. *Cult.*

TILIACEÆ.

Corchorus depressus (*Antichorus*), *L.*
—— trilocularis.
—— olitorius.
—— capsularis.

Corchorus fascicularis.
Grewia Asiatica. Gardens.
—— populifolia? Bār. (*Gangher*, Ind.)
Triumfetta rotundifolia.

MELIACEÆ.

Melia composita. *Cult.*
Azadirachta Indica. *Cult.*

SAPINDACEÆ.

Cardiospermum Halicacabum.

AMPELIDEÆ.

Cissus carnosa.
Vitis vinifera. *Cult.*

GERANIACEÆ.

Monsonia Mallica. Perhaps a var. of *Erodium niveum*, Decaisne.—See description, p. 200.

OXALIDEÆ.

Oxalis corniculata.

ZYGOPHYLLACEÆ.

Zygophyllum simplex. Seeds eaten in the desert. Called "*Alethi*," as well as *Trianthema.*
Tribulus alatus. Seeds eaten in the desert. Called "*Bhūkri.*"
—— lanuginosus.
Fagonia Cretica, *Linn.* (*Arabica*, *Mysorensis*, &c.). Very variable, with simple and ternate leaves.

RUTACEÆ.

Peganum Harmala. Desert.

CALYCIFLORÆ.

RHAMNACEÆ.

Zizyphus nummularia. Not very plentiful.
—— Jujuba β. hortensis. The wild species does not reach this region, as far as I have observed.
—— —— γ. Hysudricus.—See note, with description, pp. 200–202.
—— Spina-Christi.
—— vulgaris. In gardens: rare.

ANACARDIACEÆ.

Mangifera Indica. *Cult.*: peculiarly delicious in Multan.

MORINGACEÆ.

Hyperanthera pterygosperma. *Cult.*

LEGUMINOSÆ.

Edwardsia Hydaspica. Gardens at Multan, from the Salt range.
Crotalaria Burhia. Desert.
Lotus corniculatus. Damp sand by the rivers.
Trigonella Fœnum-græcum. *Cult.*
—— incisa.
Melilotus leucantha.
—— parviflora.
Medicago lupulina.
Cyamopsis psoraleoides. *Cult.*
Psoralea plicata. (*Bakhtmal,* Ind.) Camels delight in it.
Indigofera linifolia.
—— cordifolia.
—— enneaphylla.
—— ornithopodioides, *Schimp.* This seems to me different from *Senegalensis.*
—— tinctoria. *Cult.*
—— paucifolia. The Indian form is more torulose than the African.
Macronyx stricta, *Dalz.* (*Tephrosia tenuis,* Wall. Cat.).
Tephrosia purpurea. Rare, though so abundant in the Cis-Sutluj.
Clitoria Ternatea. *Cult.*
Sesbania Ægyptiaca. *Cult.*
—— aculeata. Fields.
Astragalus contortuplicatus.
—— tribuloides.
—— prolixus.
Alhagi Maurorum.
Æschynomene Indica.
Cicer arietinum. *Cult.*
Ervum Lens. *Cult.*
—— hirsutum. Fields.
Vicia sativa (*angustifolia,* DC.). Fields.
Pisum sativum. *Cult.*
Lathyrus sativus. *Cult.*
—— Aphaca.
—— sphæricus, *Retz.* (*angulata*). Fields.
Abrus precatorius. Jungle.
Rhynchosia medicaginea. Jungle.
—— sericea. Jungle.
Phaseolus Mungo (*Roxburghii,* W. & P.). *Cult.*
—— aconitifolius. *Cult.*
Dolichos Lablab. *Cult.*
Canavalia gladiata. *Cult.*
Dalbergia Sisoo. Wild and *cult.*
Butea frondosa. Rare, and only towards the north.
Erythrina Indica. *Cult.*
Prosopis spicigera. Most abundant.

Acacia Farnesiana. *Cult.*

—— Jacquemontii.

—— Arabica. Both the common and the cupressiform: sometimes both varieties on the same tree. It grows to a much larger size than in the N.W.P. I have measured one 16 feet 4 inches in girth, and several 11 or 12 feet.

—— modesta. Only towards the north.

Albizzia Lebec. *Cult.*: never, apparently, wild.

Cathartocarpus Fistula. *Cult.*

Cassia suffruticosa. *Cult.*

—— Tora.

—— Sophera. Rare.

Bauhinia variegata. *Cult.*

Tamarindus Indica. *Cult.*: very rare.

ROSACEÆ.

Potentilla supina.

Rosa Indica. *Cult.*

—— Damascena. *Cult.*

Neuroda procumbens. Sand-hills.

Amygdalus Persica. *Cult.*

—— vulgaris. *Cult.*

Pyrus Malus. *Cult.*

Cydonia. *Cult.*

GRANATEÆ.

Punica Granatum. *Cult.*

SALICARIEÆ.

Lawsonia alba. *Cult.* both in gardens and at a few places (*e.g.* Mailsian) in fields for the dye.

Ammannia vesicatoria.

—— multiflora.

Ameletia rotundifolia.

Rotala Roxburghii.

TAMARISCINEÆ.

Tamarix dioica. Called "*Lai.*"

—— Gallica. Called "*Pilchi.*" Occasionally producing manna.

—— orientalis (*Faras*, Royle). Called "*Pharma.*" Generally covered with salt, so much that poor people dip it in water to season their bread. The wood when burnt is most offensive and stercoraceous. It grows with great rapidity. I have measured trees of six or seven years' growth 5 feet in girth, and they fall down of old age at twenty years.

CUCURBITACEÆ.

Cucumis trigonus. Desert.

—— pubescens. Wild.

—— —— Melo. Many varieties of the Musk Melon, of great excellence.

Cucumis usitatissimus. "*Kakri.*"
—— cicatrisatus, *Stocks.* "*Albinda.*"
—— Momordica. "*Pūnt.*"
Citrullus vulgaris. *Cult.*
—— fistulosus (*St.*). *Cult.* H. J. B. iii. p. 74.—See description, p. 202.
—— Colocynthus.
Luffa pentandra. *Cult.*
—— acutangula. *Cult.*
Lagenaria vulgaris. *Cult.*
Momordica Charantia. *Cult.*, and wild in sand-hills.
Mukia scabrella.

I have not observed any species of *Trichosanthes* or *Coccinia,* which are common in Sirhind and Lahore.

AIZOONEÆ.

Trianthema pentandra, *Linn.* "*Itsit.*"—See description, p. 202.
—— crystallina, *Forsk.* "*Alethi.*" The seeds are swept up on the bare hard soil on which it grows and eaten in times of scarcity. It covers miles of the desert, particularly in the Rechnab Bār.—See description, p. 203.
—— Hydaspica.—See description, p. 203.

UMBELLIFERÆ.

Anethum Sowa.
Petroselinum sativum.
Ptychotis Ajwain.
Coriandrum sativum. Wild, among pulse fields.

RUBIACEÆ.

Hedyotis Burmanniana.
Wendlandia cinerea. Two stray specimens carried down by the Jhilum and Chenab, and growing wild.

COMPOSITÆ.

Vernonia cinerea.
Berthelotia lanceolata.
Grangea Ægyptiaca.
Blumea, sp. ——.
Eclipta prostrata.
Francœuria crispa.
Xanthium Strumarium.
Myriogyne minuta.
Trichogyne cauliflora.
Echinops echinatus.
Microlonchus divaricatus.
Cirsium arvense.
Carthamus Oxyacanthus. Not so common as in Sirhind.
—— tinctorius. *Cult.*

Microrhynchus sarmentosus.
—— nudicaulis.
Sonchus oleraceus. Rare (sand-hills).
—— Candollianus (*Zollikoferia*, DC.). The pappus is remarkable, and very different from that of the normal *Sonchi.*
Cichorium Intybus. *Cult.*
Lactuca sativa. *Cult.* for the seeds, which are used as a medicine.

COROLLIFLORÆ.

PRIMULACEÆ.

Anagallis cærulea.

SAPOTACEÆ.

Mimusops Elengi. *Cult.* A tree in the Huzūri Bagh, Multan; said to have been brought by the late Nawab of Multan from Mecca.
—— Kauki. *Cult.*

APOCYNEÆ.

Nerium odorum. *Cult.*

ASCLEPIADACEÆ.

Leptadenia Jacquemontii.—See note, p. 204.
Dæmia extensa.
Calotropis procera (*Hamiltonii*). In Bari Bār grows quite arboreous, 1½ feet in girth.
Pentatropis spiralis. The Punjab and Sindh plant is this species—not *microphylla.*—See note, p. 204.
Periploca aphylla.
Oxystelma esculentum.
Ceropegia esculenta. Both the tubers and leaves eaten as a vegetable. (*Gahlōt*, Ind.)—See description, p. 204.
Boucerosia edulis. Eaten as a vegetable. (*Situn*, Ind.)—See description, p. 205.

GENTIANACEÆ.

Limnanthemum Kleinianum.
Slevogtia orientalis.

BIGNONIACEÆ.

Tecoma undulata (*Jacq.*). Rare, but found both in Rechnab and Bari deserts. (*Lahúra*, Ind.)

CONVOLVULACEÆ.

Cressa Cretica.
Convolvulus arvensis. Fields: remarkably large and sweet-scented.
—— pluricaulis. Desert.
Batatas pentaphylla. Rechnab Bār.
Ipomæa Pes-Tigridis.
—— sessiliflora. With a variety.
—— reptans. Not common.
Pharbitis Nil.
Rivea hypocrateriformis.

Cuscuta reflexa.
—— planiflora. Found in a field of Cashmir lucerne at Gogaira.

CORDIACEÆ.

Cordia Myxa. *Cult.*
—— subopposita. *Cult.*

BORAGINEÆ.

Ehretia serrata. In the Bār.
Heliotropium supinum.
—— Europæum.
—— bicolor.—See note, p. 205.
—— ramosissimum.
—— marifolium.
—— strigosum.
—— brevifolium.
Tournefortia subulata (*Edgeworthii*, DC.).
Arnebia hispidissima.
Nonnea Edgeworthii.
Trichodesma Africanum.
—— Indicum.
Anchusa hispida.

SOLANACEÆ.

Lycium Europæum (*Edgeworthii,* DC.).
Withania somnifera.
—— coagulans (*Puneeria,* Stocks). (Ind. *Akri* : the fruit *Panni* or *Panir.*)
Solanum xanthocarpum.
—— gracilipes. Rechnab Bār.
—— nigrum.
—— Melongena. *Cult.*
Datura fastuosa. *Cult.*
Capsicum ——. *Cult.*

SPHENOCLEACEÆ.

Pongatium Zeylanicum.

SCROPHULARINEÆ.

Doratanthera linearis. Desert.
Antirrhinum Orontium. Fields.
Linaria ramosissima. Chandniot.
Celsia Coromandeliana. Edges of rivers.
Herpestes Monieri. Ditto.
Mazus rugosus. Ditto.
Lindenbergia urticifolia.
—— macrostachya. Chandniot.
Veronica Buxbaumii. Fields and gardens.
—— Anagallis. Edges of rivers.
Striga euphrasioides.

OROBANCHEÆ.

Phelipæa Calotropidis. On the roots of *Calotropis* only. Differs from *lutea* in the anthers, which are mucronate, while in this they are obtuse.

LABIATÆ.

Ocymum Basilicum. *Cult.*
—— sanctum. *Cult.*
Mentha incana? *Cult.*
Salvia pumila. Edges of rivers.
—— plebeia. Ditto.
Leucas urticifolia. Rechnab Bār.
Dracophyllum Royleanum. *Cult.*

VERBENACEÆ.

Verbena officinalis.
Lippia nodiflora.
Clerodendron phlomioides.
Vitex bicolor.

ACANTHACEÆ.

Dipteracanthus patulus. Chandniot and Shahkot rocks.
Barleria ciliata. Ditto.
Acanthodium spicatum. Desert.
Peristrophe bicalyculata. Only once found.

PLUMBAGINEÆ.

Plumbago Zeylanica.

SALVADORACEÆ.

Salvadora oleoides. Most abundant: the fruit much eaten in the desert. 12 feet in girth at Thannam; at Baluana 11 feet 4 inches. (Ind. *Van*: the fruit is *Pīlū*.)

—— Indica. Rare: leaves eaten as a salad. At Pakpatan 14 feet 9 inches in girth.

PLANTAGINEÆ.

Plantago amplexicaulis.
—— Ispagula. *Cult.*

MONOCHLAMYDEÆ.

PHYTOLACCACEÆ.

Limeum Indicum, *Stocks, in Anderson, Fl. Adenensis, Linn. Journ.* v.—See description, p. 206.

Giesekia pharnaceoides.
—— rubella.

SALSOLACEÆ.

Beta vulgaris. *Cult.*
Chenopodium murale.
Spinacia oleracea. *Cult.* Not introduced by Europeans, but by the Arabs.
Kochia arenaria. Very abundant.
Sueda Indica (*Salsola lana*, Edgew.). (*Lani*, Ind.)

Anabasis multiflora. (*Lana*, Ind.) Grows in the Bari Bār to 7 or 8 feet high, like a dwarf tree.

Caroxylon fœtidum. (*Gora lana*, Ind.)

Salsola Griffithsii. (*Khar*, Ind.) Used for preparing *Sajji*, potash.

AMARANTHACEÆ.

Celosia argentea.

Amaranthus Mangostanus. *Cult.*

—— Gangeticus. *Cult.*

—— angustifolius.

—— Blitum.

Mengea tenuifolia.

Euxolus caudatus.

Achyranthes aspera.

Digera arvensis.

Alternanthera denticulata.

Pupalia lappacea.

Ærua Javanica.

—— Bovii.—See description, p. 206.

—— brachiata.

—— scandens.

NYCTAGINEÆ.

Boerhaavia elegans. (*Helra*, Ind.) Much eaten in the desert. The seeds mucilaginous.

—— diffusa.

—— repens.

—— vulvariifolia.

POLYGONACEÆ.

Polygonum glabrum.

—— Dryandri.

Rumex dentatus (*Wallichianus*).

Calligonum polygonioides.

EUPHORBIACEÆ.

Phyllanthus Niruri.

Emblica officinalis. *Cult.*

Crozophora oblongifolia.

—— plicata.

Euphorbia Helioscopia.

—— Chamæsyce.

—— granulata, *Forsk.*

Ricinus communis. *Cult.*

URTICACEÆ.

Cannabis sativa. *Forskälea* probably exists in the rocks at Chandniot, but I did not see it.

Ficus Indica.

—— religiosa.

—— caricoides.

Morus Indica.
—— Tatarica. *Cult.*

SALICINEÆ.

Populus Euphratica.
Salix Babylonica. *Cult.*
—— tetrasperma. *Cult.*

GNETACEÆ.

Ephedra alata.

ENDOGENES.

ORCHIDEÆ.

Zeuxine sulcata.

PALMÆ.

Phœnix dactylifera. Introduced by the Arabs in the seventh century; now forming vast self-sown groves.

ASPHODELEÆ.

Asphodelus fistulosus.
Asparagus, sp. Rechnab and Chaj Bārs.
Allium Cepa. *Cult.*
Uropetalum probably exists, though I never met with it.

AMARYLLIDEÆ.

Narcissus poeticus. Gardens.
Crinum, sp. Gardens.

TYPHACEÆ.

Typha latifolia.

CYPERACEÆ.

Cyperus rotundus, *Linn.*
—— procerulus.
—— Irio.
—— pygmæus. *Stylo trifido*, as also in the Egyptian and Australian forms.
Scirpus grossus.
—— affinis (*Nees*).
Fimbristylis communis, *Knth.*
Eleocharis palustris.

GRAMINACEÆ.

ORYZEÆ.

Oryza sativa. *Cult.*

OLYREÆ.

Zea Mays. *Cult.*

PANICEÆ.

Paspalum scrobiculatum. *Cult.*, but not common.
Panicum brizoides.
—— colonum.
—— coccospermum (*vestitum*, Nees).
—— psilopodium.

Panicum antidotale.
—— miliare. *Cult.*
—— Hydaspicum. Desert.—See description, p. 207.
—— miliaceum. *Much cultivated.*
Digitaria ciliaris.
—— sanguinolenta.
Oplismenus prostratus (*Pan. setigerum*, Roxb.).
—— Crus-Galli (*Pan. hispidulum*, Roxb.).
Setaria Italica. *Cult.*
—— glauca.
—— verticillata.
Pennisetum Cenchri.
Cenchrus echinatus.
—— montanus, *Nees.* Varies with green or purple spikes.
Penicillaria spicata. *Cult.*
Lappago racemosa.

PHALARIDEÆ.

Phalaris minor.

ANDROPOGONEÆ.

Imperata cylindrica (*Kœnigii*).
Erianthus Ravennæ.
Saccharum Sara.
—— canaliculatum.
—— spontaneum.
—— officinarum. *Cult.*
Andropogon Bladhii.
—— annulatus.
—— pertusus.
—— (Cymbopogon) Arriani.—See description, p. 208.
Vetiveria muricata. Abundant in the north, but ceases about 80 miles north of Multan.
Sorghum vulgare. *Cult.*
—— Halepense. Rare.
Apluda communis, *Nees* (*aristata*, Roxb.).
Elionurus hirsutus.

STIPACEÆ.

Aristida (Chætaria) *a.* vulgaris.
—— —— *β*. var. cærulescens.
—— hystricula, n. sp.—See description, p. 208.
—— (Arthratherum) Royleana.
—— funiculata.
—— Mallica, n. sp.—See description, p. 209.
—— articulata, n. sp.—See description, p. 209.
—— (Stipagrostis) plumosa, *Linn.* nec *T. Anderson.*—See description, p. 209.
—— pogonoptilum, *Jaub. & Spach*, no. 129?; no. 638 of *Stocks's Herb.*
—— hirtigluma.

AGROSTIDEÆ.

Polypogon Monspeliensis.
Vilfa scabrifolia, *Hochst.* no. 2302; no. 667 of *Stocks.*
—— commutata.
—— pallida.

PAPPOPHOREÆ.

Pappophorum Arabicum?
—— nanum (*Vincentianum*, Schmidt).
—— Persicum? An *Aucheri*? but much taller.

CHLORIDEÆ.

Eleusine Corocana. *Cult.*
—— flagellifera (*Arabica*).
Dactyloctenium Ægyptiacum.
—— var.? mucronatum. No. 54689, *Aucher.*
Cynodon linearis.
Dinebra verticillata.
Chloris villosa. Shahkot.
Schœnfieldia pallida. Rare.

ARUNDINEÆ.

Arundo Donax.
Phragmites Roxburghii.

HORDEEÆ.

Hordeum 6-stachyum. *Cult.*
Triticum æstivum. *Cult.*
—— hybernum. *Cult.*
—— durum. *Cult.*
Lolium temulentum.

AVENEÆ.

Avena fatua.

POEÆ.

Æluropus repens (*Nilotica*).
Poa annua.
Eragrostis poæoides.
—— unioloides.
—— Brownii.
—— tremula.
—— plumosa.
—— interrupta, *Roxb.*
—— viscosa, *Roxb.*
—— nutans.
—— diandra, *Roxb.*
—— cynosuroides. "*Panni.*"

BAMBUSEÆ.

Bambusa. *Cultivated* at Baghdad, 40 miles above Multan.

MARSILEACEÆ.

Marsilea quadrifolia.

EQUISETACEÆ.

Equisetum.

FILICES.

Adiantum Capillus-Veneris. In old wells.

MUSCI.

Phascum, sp.

THALAMIFLORÆ.	Cult.	Spont.	Cis Sutlej.	Sindh.	India.	Arabia & Africa.	Europe.
Ranunculaceæ	..	1	1	1	1	1	1
Menispermaceæ	1	2	1	2	1	1	..
Nymphæaceæ	..	1	1	1	1	1	..
Nelumbiaceæ	1	..	..	..	..	..	..
Papaveraceæ	1	3	2	3	1	2	2
Cruciferæ	6	11	4	9	4	9	3
Resedaceæ	..	1	1	1	1	1	..
Capparideæ	1	7	4	7	5	7	1
Polygalaceæ	..	1	..	1	..	1	..
Elatinaceæ	..	2	1	2	2	1	..
Caryophyllaceæ	..	6	5	6	6	5	5
Portulacaceæ	..	3	3	3	2	2	1
Mollugineæ	..	4	3	4	4	4	1
Frankeniaceæ	..	1	..	1	..	1	1
Tamariscineæ	..	3	2	3	1	2	1
Malvaceæ	2	9	6	9	8	8	3
Tiliaceæ	1	7	5	7	7	7	..
Meliaceæ	2	..	..	..	..	..	..
Sapindaceæ	..	1	1	1	1	..	..
Geraniaceæ	..	1	..	..	..	1	..
Oxalideæ	..	1	1	1	1	1	1
Zygophyllaceæ	..	4	2	4	3	4	2
Rutaceæ	..	1	1	1	..	1	1
Ampelideæ	1	1	1	1	1	1	..
Total..	16	71	45	68	50	61	23
CALYCIFLORÆ.							
Rhamnaceæ	2	2	2	2	2	1	1
Anacardiaceæ	1	..	..	..	..	..	..
Moringaceæ	1	..	..	..	..	..	..
Leguminosæ	23	34	28	32	25	23	10
Rosaceæ	7	2	1	2	1	2	1
Granateæ	1	..	..	..	..	..	..
Salicarieæ	1	4	4	4	4	1	..
Cucurbitaceæ	14	5	4	5	4	3	..
Aizooneæ	..	3	2	3	2	2	1
Umbelliferæ	2	..	..	..	..	..	..
Rubiaceæ	..	2	2	..	2	..	..
Synanthereæ	3	17	17	15	11	15	5
Total..	55	69	60	63	51	47	18

	Cult.	Spont.	Cis Sutlej.	Sindh.	India.	Arabia & Africa.	Europe.
COROLLIFLORÆ.							
Primulaceæ	..	1	..	1	1	..	1
Sapotaceæ	2	..	..	..	..	..	..
Apocyneæ	1	..	..	..	..	..	..
Asclepiadaceæ	..	8	4	8	4	4	..
Gentianaceæ	..	2	2	1	2	1	..
Bignoniaceæ	..	1	1	..	1	..	..
Convolvulaceæ	..	11	9	11	9	5	2
Cordiaceæ	2	..	..	..	..	..	..
Boragineæ	..	12	10	12	7	7	3
Solanaceæ	3	6	4	6	5	3	3
Sphenocleaceæ	..	1	1	1	1	1	..
Scrophularineæ	..	11	10	11	10	4	3
Orobancheæ	..	1	1	1	..	..	..
Labiatæ	4	3	2	3	3	2	..
Verbenaceæ	..	4	4	4	3	2	..
Acanthaceæ	..	4	3	4	3	3	..
Plumbagineæ	..	1	1	1	1	1	..
Salvadoraceæ	..	2	2	2	1	..	..
Plantagineæ	1	1	1	1	..	1	1
Total..	13	69	55	67	51	34	13
MONOCHLAMYDEÆ.							
Phytolaccaceæ	..	3	2	3	2	3	..
Salsolaceæ	2	6	4	6	2	4	2
Amaranthaceæ	2	13	10	13	13	11	2
Nyctagineæ	..	4	2	4	3	4	..
Polygonaceæ	..	4	3	4	3	4	2
Euphorbiaceæ	2	6	4	6	4	6	2
Urticaceæ	1	5	5	5	5	2	1
Salicineæ	2	1	..	1	..	1	..
Gnetaceæ	..	1	1	1	1	1	..
Total..	9	43	31	43	33	36	9
ENDOGENES.							
Commelinaceæ	..	1	1	1	1	..	..
Orchideæ	..	1	1	1	1	..	..
Palmæ	1	..	..	..	..	..	..
Asphodeleæ	1	2	2	2	1	1	1
Amaryllideæ	2	..	..	..	..	..	..
Typhaceæ	..	1	1	1	1	1	1
Cyperaceæ	..	8	7	8	8	5	2
Graminaceæ :—							
Olyreæ	1	..	..	..	..	..	..
Paniceæ	6	16	14	15	14	10	5
Phalarideæ	..	1	1	1	1	1	1
Andropogoneæ	2	13	11	13	11	7	2
Stipaceæ	..	9	7	5	3	5	..
Agrostideæ	..	4	3	4	3	2	1
Pappophoreæ	..	3	..	1	..	3	..
Chlorideæ	1	7	5	6	5	5	2
Arundineæ	..	2	2	2	2	1	1
Hordeeæ	4	1	1	1	..	1	..
Aveneæ	..	1	1	1	1	1	1
Poeæ	..	12	10	12	8	6	3
Bambuseæ	1	..	..	..	..	..	..
Oryzeæ	1	..	..	..	..	..	..
Total..	20	82	67	74	60	49	20

	Orders.	Genera.	Cult.	Spont.	Cis-Sutluj.	Sindh.	India.	Arabia & Africa.	Europe.
Thalamifloræ	22	50	16	71	45	68	50	61	23
Calycifloræ	8	52	55	69	60	63	51	47	18
Corollifloræ............	16	52	13	69	55	67	51	34	13
Monochlamydeæ........	9	27	9	43	31	43	33	36	9
Exogens	55	181	93	252	191	241	185	178	63
Endogens	8	41	20	82	67	74	60	49	20
Phanerogams	63	222	113	334	258	315	245	227	83
Acrogens, exclusive of Fungi	4	4	..	4	4	4	4	4	4
Grand total..	67	226	113	338	262	319	249	231	87

Notes on some of the Plants in the foregoing list.

POLYGALA.

There seems to be very much confusion about these *Blepharidia*. Dr. T. Anderson, in his 'Florula Adenensis,' unites a vast number of the forms published in DC. Prod. and Wight and Arnott, Prod., under the name *triflora* of Linnæus. I have examined the original specimens in the Herrmann herbarium in the British Museum, no. 269, published by Linnæus in the 'Flora Zeylanica,' vol. ii. p. 10; I have carefully compared them with the numerous specimens in the Kew herbarium, and have satisfied myself that there are three or four distinct species. *Triflora* is *rosmarinifolia* exactly. The *triflora* of Wight and Arnott has not such pointed leaves and alæ; the capsules are not at all margined, and usually pubescent, not glabrous. Both of these forms, as well as the third, *serpyllifolia*, to which I would refer the Aden species, though it differs somewhat from the Indian form, are prostrate. The last form is that described by DC. under the name *erioptera*, which does not suit this particular form, as the alæ are almost glabrous—only delicately ciliolate; it may probably be the "*obtusata*" of DC. The pubescent form obtains principally to the West of Africa, while those from Egypt and Abyssinia are almost identical with the Multan type.

HIBISCUS LAGUNEOIDES. Bipedalis, ramosus, omnino pilis stellatis pubescens, foliis late ovatis plus minus trilobatis repandis, stipulis minutis subulatis, floribus axillaribus solitariis, pedicellis (ramulisque junioribus) glanduloso-pilosis; involucello 9-fido; calyce 5-fido nervoso nec inflato, hirtello, pubescentia biformi; corolla parvula, petalis oblique truncatis calyce vix longioribus albis demum rubentibus; staminibus monadelphis biseriatis; antheris innumeris; stigmatibus 5; capsula ovata pubescente, pilis stellatis setisque brevibus rigidis, 5-loculari, loculis 12-spermis, seminibus nigris glabriusculis.

Both in the tamarisk jungle and in cotton-fields.

MONSONIA MALLICA. Foliis cordatis sericeis obtusis, scapis hirsutis, bracteis barbatis, sepalis mucronatis.

Multan; Sindh.

Annua, radice fibrosa, caule subnullo, foliis paulatim approximatis cordatis obtusis utrinque sericeis, nec niveis nec hirsutis nec nervosis, stipulis cuneatis ciliatis; scapis prælongis vix erectis, pilis longis patentibus albis hirsutis; umbellis multifloris, bracteis subulatis apice pilis longis barbatis, pedicellis elongatis pubescentibus; sepalis obovatis sericeo-pubescentibus marginatis longe mucronatis; petalis istis æqualibus integris; staminibus 15 in phalangibus 5 monadelphis; stylis sericeis; achenio basi acuto apice truncato rugoso pubescente, rostro prælongo plumoso, 2½–3 poll. longo.

This differs from *M. nivea* in the pubescence and texture of the leaves and the mucro of the sepals, and from *M. hispida* in the size and pubescence. Cf. Boissier, i. 8. p. 122.

I have very great hesitation about the species of *Zizyphus* cultivated in India or found in the Punjab.

The *Z. vulgaris* is cultivated in Cashmir, and, rarely, in gardens in the Punjab: I have not observed it in Multan. *Z. Jujuba* is abundant wild in the northern part of the Punjab, but not in Multan, where *nummularia* is only found sparingly, compared to the profusion seen in the northern districts. Although in the usual form no one could hesitate about the species, I have seen small stunted specimens of *Jujuba* that it would be difficult to distinguish from *nummularia* with thorns shorter than usual.

Z. Spina-Christi is found in gardens, but sparingly, and with some difference from the typical and Syrian form. The bark, though paler than the common Punjab *Ber*, is not the clear grey so remarkable in all the Syrian and African specimens and descriptions; and the inflorescence is almost glabrous and with almost sessile cymes, not downy and dichotomous. The petals in all that I have examined are emarginate, whereas they are entire in *Jujuba*. The name *Nabeca* was given by Forskahl to this species, after the Arabic name *Nabc*; but, unfortunately, the name *Napeca* was applied by Linnæus to some specimens collected in Ceylon by Herrmann, now in the British Museum. I have compared the original specimens with those under the same name in the Linnean herbarium, and I find them to be a form much resembling *Œnoplia*, but differing in having more glabrous leaves, longer peduncles to the cymes, and double thorns. I see specimens in the Kew herbarium almost exactly similar, from the Concan and Ceylon, from Mr. J. Walker; and it will be interesting if botanists on the spot, in Ceylon and the Concan, will ascertain if it be a different species or only a variety.

There now remains to me to define the form most abundant in the Punjab. I am not sure that it is anywhere truly wild, though I have observed it in the desert, but probably dropped by man or bird.

This species is immediately noticed on entering the western part of the Cis-Sutluj States, where it first appears as a small tree (the branches not drooping as the typical wild or cultivated *Jujuba*), and with almost smooth leaves. There is a slight pubescence in young specimens, but they are almost glabrous when old. The fruit is globular and dark-coloured, not orange or red like the wild Ber, or green like the cultivated. The leaves are usually roundish ovate, more or less serrulate. The inflorescence varies from perfect smoothness to thick tomentum. The cymes are usually short, sometimes reduced to a fascicle of flowers as in *Lotus*.

At first I had referred this to *Lotus*, but on comparison I find it is quite distinct; and there are no specimens in the herbaria leading from one form to the other; while it is difficult to consider this form to be only a variety of *Jujuba* as it has hitherto been defined.

Wight and Arnott define it by the tawny colour of the under surface of the leaf; but in the cultivated specimens, as well as in other northern wild specimens, the pubescence is almost grey, while we see a similar difference in the colour of the tomentum in *Œnoplia* and *nummularia*. Therefore I believe it is more correct to consider it a well-marked variety of *Z. Jujuba*.

ZIZYPHUS JUJUBA. Arbor, foliis ovatis serrulatis v. integris, spinis geminis, una longiore rectiuscula, altera uncinata, cymis brevibus, petalis unguiculatis concavis integris demum reflexis.

a. spontaneus. Foliis subtus ferrugineo-tomentosis, drupis sphæricis flavo-aurantiacis.

β. hortensis. Foliis late ovalibus 3-nerviis basi inæqualibus *integerrimis* nervis apice breviter mucronatis, sursum glabris, subtus cano-tomentosis, cymis subsessilibus; pedicellis pedunculo longioribus vix petiolum æquantibus, multifloris, alabastris depressis tomentosis sublanatis; drupis ovatis viridibus vel flavescentibus.

Hortis passim.

γ. *Hysudricus.* Foliis ovalibus obtusissimis basi paulo inæqualibus, junioribus pubescentibus demum utrinque glabratis serrulatis, cymis petiolo sublongioribus, pedicellis vel *glabris* vel lanatis integris ; drupa globosa viridi-purpurascente.

Punjab, passim.

CITRULLUS FISTULOSUS, *Stocks in H. J. B.* vol. iii. p. 74. Hirsutus, foliis cordatis sinuato-lobatis v. pinnatifidis, flore hirsuto, stam. non nectariferis, pepone globoso hirsuto.

Sindh; Multan.

Hirsutissimus, caulis demum fistulosus. Folia cordata, sinuato-lobata pinnatifidaque laciniis obtusis rotundatis; juniora molliter, seniora scabre hirsuta, glandulosa, moschata, pallide virescentia. Cirrhi 2–4-fidi; bracteæ cucullatæ, glabriusculæ, 1–3-floræ. Flores pedunculati; ♂ pedunculis fœmineis triplo longioribus. Calyx complanatus, tubo subnullo, breviter 5-dentatus, dentibus subulatis. Corolla subrotata v. cyathiformis, extus hirsutissima, intus pallide flava glabra venosa 5–7-partita. Stamina 5, basi quasi articulata, nec fornicata nec ciliata, 2–3–4-adelpha, connectivo 3–4-lobato. Anthera sinuata; discus centralis depressus, subtrigonus. ♀ Calycis tubus contractus, brevissimus, limbo plano breviter 5-dentato. Corolla extus hirsutissime, intus glabre 5-partita (profundius quam in masculo), segmentis ovatis acutis. Stamina rudimentaria, 2–3, quorum 2 bidentata, glabra, nec basi nectarifera. Discus glandulosus, annularis, pulvinatus. Stylus brevis, crassus, 3-fidus, stigmatibus convoluto-infundibuliformibus. Ovarium 3-loculum, globosum, hirsutum. Pepo globosus, seminibus marginatis obtusis.

This species is found in Sindh and Multan, and much cultivated under the names of *Tinda*, *Albinda*, and *Dil-pasand*, "beloved to the heart": eaten cooked as a gourd. It seems a very different species from the water-melon, to which it is nearest. The stamina of the latter are nectariferous both in the male and female flower, as well as in *Colocynthis*; the anthers are only sinuate, not gyrose or conduplicate or anfractuose. M. Naudin refers this to *C. vulgaris*, but without any note as to whether he has made any experiments to prove the unity of the species.

TRIANTHEMA PENTANDRA, *Linn.* Foliis oblique ovatis v. oblongis inæqualibus; floribus axillaribus, uno sessili cæteris brevi-pedunculatis 3–7-nis pentandris; fructu duro tetraspermo circumscisso, operculo clauso bipartibili loculo mitriformi.

North-west Provinces.

Annua, diffusa vel suberecta, ramis teretibus glandulosis. Folia opposita, inæqualia, oblique ovalia vel oblonga, subtus glauca, utrinque plus minus crystallino-papillosa, petiolis canaliculatis marginatis quasi amplexicaulibus glandulosis. Flores in axilla nidulans, unus sessilis, cæteri

brevi-pedunculati terni vel septeni. Bracteæ bracteolæ scariosæ, acuminatæ. Calyx quinquepartitus, segmentis dorso carinatis cuspidatis margine membranaceis intus coloratis (rubris vel rarius albis) cum junioribus quinque alternis. Ovarium biloculare, 4-ovulatum, apice mitriformi bilobo (vel emarginato), lobis emarginatis. Styli 2, divaricati, longe stigmatosi. Fructus durus, circumscissus, operculo bipartibili dispermo clauso; cupula membranacea, disperma, placenta vera centrali sed alternatim ad parietes coalita. Semina subcompressa, rugosa, albumine pauco.

Common in cultivated ground as well as in the desert: it is called *Itsit*, and is used to procure abortion by the natives. It is generally reddish or purple, but has rarely a green fruit and stalk. It is very different from *T. pentandra β*, DC. Prod. iii. 852, which is the *obcordata* of Roxburgh.

TRIANTHEMA CRYSTALLINA. Papillosa, foliis ellipticis (vel ovalibus v. spathulatis), floribus 5–6-andris monogynis, calyce pentagono nervoso, fructu dispermo operculo cupuliformi aperto.

Arabia. India, from the Peninsula to the Punjab.

Diffusa, ramosissima, crystallino-glandulosa, ramis stellatim prostratis teretibus. Folia subopposita, crassa, elliptica, ovalia v. spathulata, vel in Pentepotamia elliptica margine revoluto semiteretia, petiolis marginatis glanduloso-fimbriatis (in ramis omnibus persistentibus marcidis). Flores terni (in *W. & A.* et *DC.* congesti), axillares, bibracteolati. Calyx pentagonus, 5-fidus, segmentis late cuneatis 5–7-nerviis, marcescens, subhyalinus, apertus. Stamina 5, vel potius 6, raro 7. Stylus 1. Ovarium truncatum, supra cupuliforme. Fructus dispermus, placenta laterali, operculo aperto. Semina compressa, cochleata, rugosa, embryone albumen farinaceum paucum cingente.

This is found both in the Peninsula and Arabia with broader leaves than the Punjab form, and less crowded branches; but I cannot consider them even as varieties. It varies in having green or red branches. It is not common in cultivated places, but in the Rechnab desert there are miles of ground covered with it; it is eaten under the name of *Alethi* (as well as *Zygophyllum simplex* and *Tribulus alatus*). The women sweep up the seeds from the bare hard soil with little whisks, and they are then winnowed and sifted.

TRIANTHEMA HYDASPICA. Papillosa, prostrata, foliis crassis ovatis, floribus in dichotomia sessilibus solitariis 5–7-andris digynis, fructu polyspermo biloculo.

Pentepotamia and Sindh.

Annua? Prostrata, omnino plus minus crystallino-punctata, ramis teretibus glanduloso-puberulis coloratis dichotomis. Folia opposita, crassiuscula, ovata, obtusa, margine revoluto, petiolo membranaceo-dilatato.

Flores solitarii, sessiles in dichotomia. Calyx 5-fidus, in sinibus segmentorum dentibus 5 (ut in *Ammannia*), acute pentagonus, segmentis ovatis extus herbaceis in mucronem glandulosum (uno excepto) productis, intus plus minus petaloideis roseis, demum in fructu stellatim patentibus. Stamina 7 (*fide Stocks* 5), filamentis filiformibus, antheris roseis. Styli duo, disjuncti, incrassati, stigmatosi. Ovarium biloculare, pluri-ovulatum, placenta centrali. Fructus pyxiformis, circumscissus, operculo clauso 2-loculari; capsula bilocularis, loculis membranaceis hinc parietis membranis sejunctis ita ut capsula pseudo-4-locularis fingitur. Semina numerosa, 8–10 in utroque loculo, cochleæformia, testa nigra rugosissima, embryone albumen paucum farinaceum cingente, cotyledonibus planis.

This appears to be peculiar to the basin of the Indus. Dr. Stocks referred it, in his letters and herbarium, to the *Diplochonium* of Fenzl. It seems to be quite different from the original species of that genus, *D. uvarioide* from the Cape being polyandrous and with smooth shining seeds. The fruit, habit, and calyx agree with this; but *Trianthema obcordata* has numerous stamens and seeds, and therefore must be referred to *Diplochonium*, if this be not rejoined to *Trianthema*.

Leptadenia Jacquemontii, though often leafless as described by Decaisne, as often has linear leaves exactly like those of *L. Spartium*; but the form of the corona and the pubescence of the corolla are different.

Pentatropis spiralis differs both in flower and foliage from *P. microphylla*, the Peninsular species. (See Pl. I. fig. 9.)

The leaves of the Punjab species are from ovate to almost linear with a gradual acumination, whereas those of *microphylla* vary from oval to ovate with a short abrupt mucro. The laciniæ of the corolla are erect, scarcely ever opening, and never reflexed, as are those of the latter, while the divisions of the outer row of the corona are blunt and rounded, not rather acutely calcarate as in *microphylla*.

Compare the dissections of *spiralis* by Decaisne (Ann. Sc. Nat. ii. 9, 11) with those of *microphylla* by Wight (Icones, ii. 352).

CEROPEGIA ESCULENTA. Volubilis, foliis carnosis ovatis linearibusve, umbellis multifloris, coronæ stamineæ lobis lateralibus obtusis.

Multan; Sindh.

Radix tuberosa, volubilis, glabra. Folia glabra, carnosa, ovato-oblonga vel linearia, 2–7 poll. longa, $\frac{1}{2}$ ad 2 lata. Umbellæ compositæ, multifloræ. Calyx brevissimus. Corolla vix pollice longa, basi et fauce inflata, tubo longo, laciniis brevibus apice coalitis, pallide viridi-purpurascens, intus

leviter barbatis. Corona lobis exterioribus obtusis, interioribus ligulatis multo longioribus. Folliculi divaricati, longe cylindrici, glabri.

The leaves (which are acid) and the tubers are eaten: called *Gahlot*.

This differs from *bulbosa* of Roxb. in the exterior lobes of the corona, which are blunt, and not acute as in *bulbosa*, which I have found at Banda. The flowers also are smaller, while the leaves are larger.

Boucerosia edulis (Pl. I. fig. 1–8). Erecta, ramis subteretibus, foliis caducis, floribus pedicellatis geminis, corolla glabra laciniis subulatis.

Multan; Sindh.

Rhizoma stolonosum, crassum, ramis radicantibus, radicibus fibrosis. Rami erecti, succulenti, subteretes, 4-sulcati. Folia opposita, cuneata v. elliptica, caduca. Pedicelli gemini, alares, graciles, subpenduli, demum erecti, bibracteati, bracteis subulatis minutis. Calyx 5-partitus, segmentis acutis pellucido-marginatis. Corolla 5-fida, utrinque glabra, venacea, basi purpureo-striata, tubo inflato hemisphærico, laciniis subulatis attenuatis reflexis. Corona 15-fida, segmentis 5 ligulatis in antheris incumbentibus, 10 intermediis brevioribus falcato-subulatis intus cavis purpurascentibus nectariferis. Pollinia gibba, apice pellucida. Folliculi erecti, teretes, lævissimi, glaberrimi, valde attenuati. Semina marginata, alata, longe comosa.

Edulis, subacida, sponte in Salvadoretis crescit, ibi colligenda in foro venditur sub nomine *Situn*.

I refer our Desert species of *Heliotropium* to *bicolor*, Hochst. & Steud. (no. 62, DC. ix. 546), and *marifolium*, Retz. (no. 66, p. 547). I cannot agree in uniting these and several other species to *strigosum*, as Dr. T. Anderson proposes in his 'Florula Adenensis'—at least I consider it premature; for though there are many points of resemblance, there are plenty of distinguishing marks. I have carefully examined all the specimens in the Kew and Linnean herbaria, and although there may be some which are too difficult to refer to the correct species without very minute and almost microscopic examination, I feel satisfied that it is safer to leave these forms as species till more thoroughly examined in living specimens.

The distinguishing marks may be taken, firstly, in the habit—*erect* (nos. 62, 63, 64, 67, 70, 72, DC.) or prostrate (65, 66, 71, &c.). The shape of the leaves—linear, linear-lanceolate, or elliptic or oval. The laciniæ of the calyx also give distinct marks: some are long, linear, and acute (62, 67, 72, 78; 7015, Wall.); others free, short, and blunt (63, 66, 70; 1389, 1392, Wight; 2092, Wall.). The nuts also give good marks: some are almost smooth (77, 78; 1389, Wight); some smooth below and strigose above (64); others (as 62, 63, 66, 72; and 1390 of Wight) thickly strigose; some are almost exactly globose, but others distinctly four-lobed. The anthers in many have hairs, converting the apex into a little pencil, while in other species they are wanting and are either simply apiculate or even blunt. The stigma in *linifolium* is smaller and *cordiform* obclavate, in all the rest parasol-shaped, with the apicula shorter or longer according to the species.

The throat of the corolla is usually closed with hairs, but in this, which I have referred to *bicolor*, it is open and bare. I have not had an opportunity of examining this point in an Arabian specimen.

Finally, we find every shade of pubescence, from the soft down of *tenuifolium* (no. 67) to the densely strigose forms of *strigosum*, *marifolium*, and *scabrum*.

LIMEUM INDICUM, *Stocks, MSS.* Prostratum, foliis suboppositis inæqualibus oblique ovatis vel rotundis mucronatis glabris, cymis brevi-pedunculatis, petalis hyalinis obcuneatis 3-dentatis, stam. 7, coccis lævibus depressis.

Sindh to Punjab.

Annua? Rami prostrati, velutini, ad nodos incrassati, ramulis alternatim brevioribus quaque axilla. Folia subopposita, oblique ovata v. rotundata, mucronata, integerrima, utrinque glabra, crassiuscula, petiolis brevibus subamplexicaulibus stipulam mentientibus. Cymæ brevissimæ, pedunculatæ, axillares vel supra-axillares, pedicellis bracteolatis, bractea scariosa acuta. Sepala 5, quincuncialia, ovata, acuta, herbacea, margine membranaceo albo. Petala 5, hyalina, unguiculata, obcuneata, apice truncata, tridentata, cum sepalis alterna. Stamina 7, filamentis basi dilatatis in discum glandulosum subcoalitis persistentibus, antheris 2-lobis introrsis. Ovarium 2-lobum, stylis 2, lobis contrariis, loculis 1-ovulatis. Fructus dicoccus, depresse subsphæricus, lævis, indehiscens. Seminis testa membranacea. Embryo annularis, albumen farinaceum amplectens, cotyledonibus longis linearibus.

The habit is that of *Glinus* or *Gisekia*. It differs from the generic character as given in DC. or Endlicher in having opposite leaves and smooth cocci.

ÆRUA BOVII, *Webb.* Ramosissima, dioica, lanuginosa, foliis sessilibus linearibus mucronatis, bracteis scariosis subglabris, stylo stigmatibus breviore.

Deserto Rechnab.

Dioica, erecta, ramosissima, lanugine stellata brevi vestita. Folia alterna, linearia, basi attenuata, apice mucronata. Spicæ axillares terminalesque simplices vel ramosæ ita ut tota planta panicula vasta videtur. Flores terni, congesti, bracteis scariose argenteis obtusis subglabris. Calyx 5-partitus, laciniis extus longe lanatis, duabus exterioribus majoribus scariosis, tribus interioribus herbaceis linea viridi vel rubra notatis angustioribus.

♂ Stamina in annulum connexa, staminodiis obtusis 2-dentatis coloratis, filamentis calyce longioribus purpureis antherisque purpureis, polline luteo. Ovarium minutum, stylo nullo.

♀ Cupula staminifera 10-dentata, dentibus alternis (staminibus abortivis) acutis. Stylus ramis stigmatiferis 1½ brevior. Ovarium 1-loculum. Semen lucidum.

This species has been confused with *Javanica*, from which it differs in habit, leaves, and the minute character of the style and bracts. In *Javanica* the style is equal to the stigmatic branches, and the bracts are lanose, not glabrous. The true *Javanica* has short branches. *Javanica* has but few and rare male flowers (as remarked by Forskahl, p. 170), whereas *suaveolens* has as many male plants as female; and *Javanica* also is not sweet-scented. They both grow in the same neighbourhood, so that there is plenty of opportunity to compare them. I therefore consider *Æ. β. Bovii* is a distinct species rather than a variety as it has been considered by Webb in the Niger Flora, p. 173, and DC. Prod. xiii. p. 299.

PANICUM (Sect. xi. VIRGARIA, *Trin. ap. Steud. Gram.*) HYDASPICUM. Foliis planis sparse pilosis, gluma exteriore 3-nervia, superiore 7-nervia.

Rechnab Bār.

Culmi subcompressi, geniculati, nodique glabri. Vagina laxa, glabra, os versus ciliata, ligula minute ciliato-membranacea. Folia plana, sparse pilosa, margine minutissime serrulata, utrinque 3-nervia, sæpe purpurascentia. Paniculæ laxæ, ovatæ, pedunculo compressiusculo filiformi, ramis ramulisque capillaribus undulatis scabro-setosis. Locustæ ovoideæ, solitariæ, longe pedicellatæ. Gluma exterior flosculo plus duplo brevior late ovata, acuta, *trinervia.* Gluma superior 7-nervia, breviter mucronata. Flosculi inferioris palea inferne herbacea, semi-7-nervia, breviter mucronata; palea superne hyalina, elliptica, acutiuscula, integra.

☿ Floris superioris paleæ lævissimæ, muticæ. Lodiculæ majusculæ, ovario longiores, bilobæ, carnosæ. Ovarium læve. Styli 2, divergentes. Stigma purpureum. Stamina vix exserta. Antheræ fuscæ.

This differs from the cultivated *miliare*, Lam. (no. 483 in Steud. Gram. p. 73) in the glumes. The nerves in the lower are much stronger than any in this section that I have observed, and shorter. The upper are 7-, not 9–13-nerved. From *coloratum*, Linn. (no. 478. *ib.*) it differs in the absence of the raised glands from which the

hairs rise in the vagina. *Repens*, Lam., *arenarium* (no. 476. *ib.*), and *paludosum*, Roxb. (no. 465. *ib.*) have blunt glumes, and live in water.

Andropogon (Cymbopogon) Ariani. Cæspitosus, foliis brevibus complanatis, pedicellis pilis albis locusta longioribus, glumis inferioribus 5–9-nerviis ciliatis, superioribus 3-nerviis.

Deserta; Punjab.

Dense cæspitosus. Folia plana, brevia, glaucescentia. Vaginæ glabræ, ligula membranacea paleacea. Culmi glabri, erecti, 1–3-pedales. Paniculæ foliaceæ; pedunculi articulati, articulis breviter barbatis, vaginulis margine membranaceis, cito marcidis, subconjugatis. Spicæ cylindricæ, pedunculos æquantes. Locustæ geminæ, una sessilis (☿), altera pedicellata (♂). Glumæ utriusque bicarinatæ, ciliatæ, acutæ, subbifidæ, carinis serrulatis. Flosculi sessilis paleæ hyalinæ, ciliatæ, superior bifida aristata, arista locustam æquante. Lodiculæ grosse eroso-truncatæ, subbidentatæ. Flosculi ♂ pedicelli dense pilosi, pilis inæqualibus locustam æquantibus. Paleæ integræ, hyalinæ, serrulatæ, deciduæ. Antheræ luteæ. Stigmata aurantiaca.

There are several forms very much resembling one another, and which have been confused together in herbaria. This species differs from all in the plane, not convolute, leaves. *Circinatus*, Hochst. (Steud. Gr. no. 294, p. 387) differs from all in the indurated polished glume. *Oliverii*, Boiss. (no. 295. *ib.*; Desf., 288. *ib.*) has rough convolute leaves, longer than those of *laniger*. The pedicel and rachis have hairs equalling the floscules. The glumes are 5-nerved. *Laniger* (from Algiers) has much shorter convolute leaves, the pedicels not quite reaching to the floscules. The glumes 7–11-nerved.

There is another species, abundant in the lower Himalaya, differing in having longer, linear convolute leaves, spikes defracted, with much shorter hairs in the pedicels, and scarcely aromatic—almost the same as the Persian *Oliverii*.

Aristida (Chætaria) hystricula. Pusilla, glabra, gluma superiore acutata inferiorem ovulatam mucronulatam subduplo superante.

Sindh and Multan. (*Stocks*, No. 187 partim.)

Spithamæa, pallescens. Culmi graciles, glabri, striati. Vaginæ breves, ore pilis albis, longe ciliatæ. Folia glabra, convoluta, pollicaria. Paniculæ breves, paucifloræ. Gluma inferior ovata, acuta, carina serrulata in mucronem abeunte (2-linealis); superior sublævis, linearis, in mucronem hispidulum acutata (3–3½-linealis), quandoque fissa. Flosculus hispidulus, arista non articulata, stipite 8–10-lineali, setis subæqualibus 1–1½-pollicaribus hispido-scabris.

The habit is very unlike *Hystrix* (Linn. fil.; Steud. Gram. no. 99, p. 141), though the technical description is too much like.

ARISTIDA (ARTHRATHERUM) MALLICA. Foliis scabris *pilosis,* glumis subæqualibus (inferiore paullo *longiore*) acuminatissimis in *setula* hispidula terminatis.

Multan.

Nana, vix spithamæa, culmis parce pilosis. Folia scabra. Glumæ in setula hispidula terminatæ, acuminatissimæ, longior paullo brevior (5–7-linealis) carina serrulata. Gluma superior lævis, 1-nervia (4½–6-linealis). Flosculus scaberrimus; arista paullo *super* caryopsem secedens, stipite scabro-hispido 8–9-lineali, setis duabus 10–12 lin., tertia 14–15-linealibus.

This species is technically most like *Royleana,* Trin. (Steud. Gr. no. 177, p. 143), but the habit is very different; it is of a reddish colour, and very dwarf. It seems to approach nearest to *A. lieocalycina,* Trin. (Steud. Gr. no. 120, p. 146), but I have not seen an authentic specimen of that; the proportion of the glumes also is at variance.

ARISTIDA ARTICULATA. Erecta, glabra, foliis subacerosis, panicula coarctata, glumis subæqualibus, arista ad apicem stipitis articulata.

Rechnab deserto.

Culmi erecti v. geniculatim decumbentes. Vaginæ nodique glabri. Ligula pilosa. Folia sesquipollicaria, subacerosa. Panicula coarctata. Glumæ hispidulo-scabræ; inferior paullo brevior, carinata, acuta, mucronulata; superior bifida, intra dentes setula mucronata. Flosculus striato-hispidus; arista in glumis latitans, ad apicem stipitis articulata, setis tribus subæqualibus 6–7-linealibus.

The habit is that of *rigescens* (R. S.; Steud. Gr. no. 100, p. 141); but I do not observe any other specimens of this species in the Kew herbarium, nor any in which the awn is jointed at the branching of the setæ.

ARISTIDA (STIPAGROSTIS) PLUMOSA (*Linn.*; *Steud. Gr.* no. 125, p. 141) (*lanata* of Forskahl).

This species I have found both at Jhung and in the sand-hills to the south of the Multan district. I cannot agree with Dr. T. Anderson in referring the Aden species to this. One of the original specimens in the Linnean herbarium is identical with this. The other seems to be rather the "*obtusa*" of Delile (no. 128, Steud. Gr. p. 144). Col. Munro, in his paper on the Linnean grasses, makes no remark on this second specimen, which assuredly is a different species from the true and original *plumosa.*

In his Aden Flora Dr. T. Anderson unites *A. vulgaris,* Trin. (Steud. Gr. no. 66) to *A. Adscensionis,* Linn. (no. 76); but the blunt truncate glumes appear to me to be a most distinct characteristic.

Unfortunately I have lost or mislaid all my meteorological tables. I append an abstract of the only months I have found.

1850.	Minimum.			Maximum.			Mean.	Direction of Wind.	Rain.
	Extreme.		Mean.	Extreme.		Mean.			
April .	60°	73°	67°·7	87°	108°	95°	81°·8	13½ days N., 6½ S.	in. 0·27
May . .	66	88	76·7	95	118	108	93·35	$12\frac{6}{2}$ N., 2 S., $6\frac{6}{2}$ W., 2 N.E., 2 S.E., 2 S.W.	0
June .	76	89	83·6	99	117	111	97·66	6 N.–N.N.E., 24 S.–S.S.E.	0
July . .	70	87	79·4	88	113	106	92·8	4½ N., 5 N.E., 5½ E., 9½ S., 5 S.W., $1\frac{3}{2}$ W.	2·26
Aug. .	64	83	78·4	92	109	103	91·1	12 N., 4 N.E., 3 E., 2 S.E., 8 S., 9½ S.W., 2 W.	0
Sept. .	69	78	72·9	97	108	99·6	86·2	$3\frac{2}{3}$ N., 3½ N.E., $1\ \frac{1\cdot5}{2}$ E., $\frac{1\cdot5}{2}$ S., $4\frac{2}{2}$ S.W., 1 W.	0

DESCRIPTION OF THE PLATE.

Fig. 1. *Boucerosia edulis.* Corolla opened out.
2. Gynostegium and staminal crown, looking down.
3. Ditto, the staminal crown opened out.
4. Ditto, profile.
5. Part of corona opened out.
6. Ditto, magnified from the outside.
7. Ditto, ditto, from the inner side.
8. Ditto, one of the inner scales separated.
9. Coronal leaf of *Pentatropis spiralis*, copied from Decaisne, Flora Sinaica.
10. Coronal leaf of Multan form.
11. Coronal leaf of *P. microphylla*, according to Wight's Icones.

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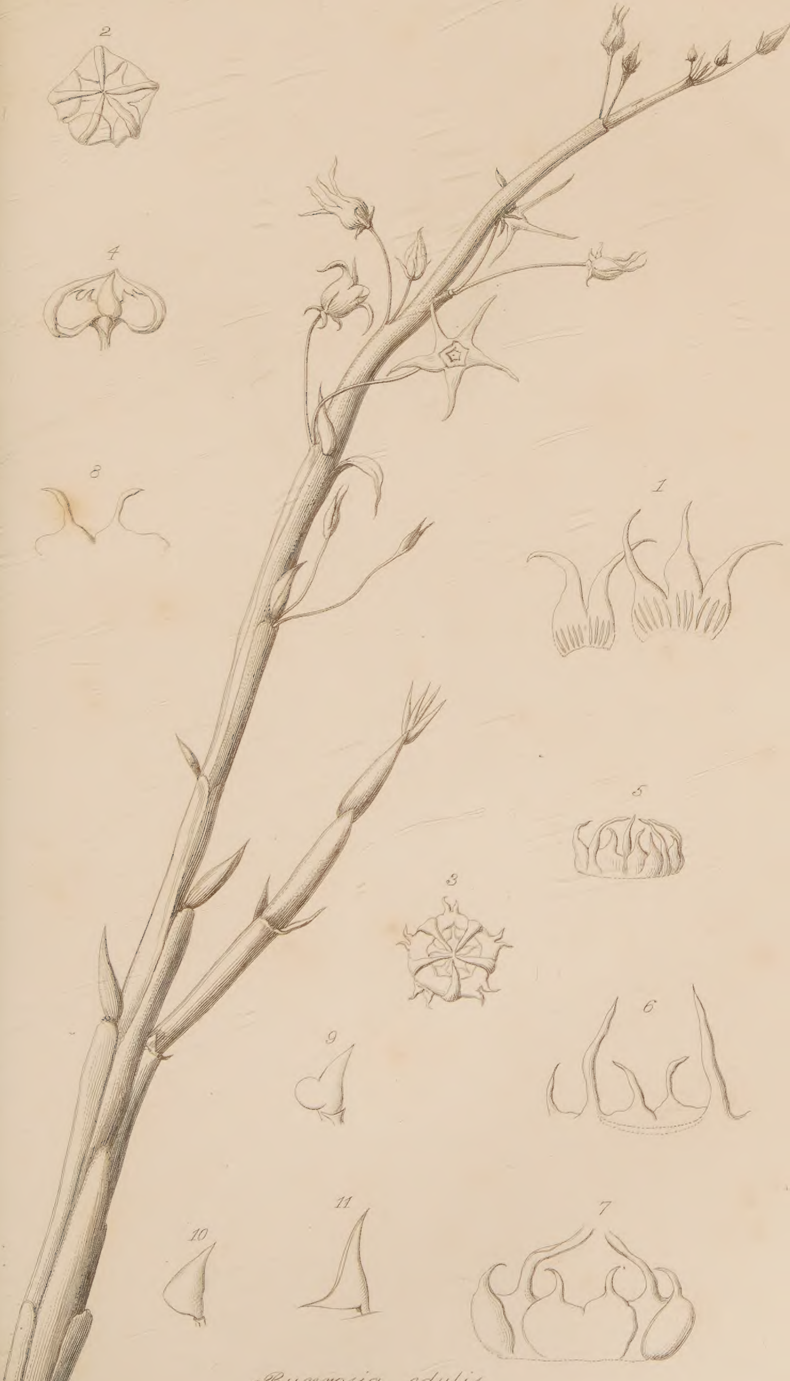

Bucerosia edulis.